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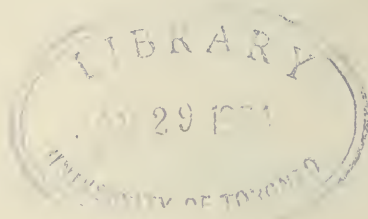
A REPRINT
OF THE LAST (1880) EDINBURGH AND LONDON EDITION
OF CHAMBERS'S ENCYCLOPÆDIA,

With Copious Additions by American Editors.

FIFTEEN VOLUMES.

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AMERICAN PUBLISHER'S NOTICE

THIS work, although based upon Chambers's Encyclopædia, whose distinguished merit is widely known, differs from it in important respects. It could scarcely be expected that an Encyclopædia, edited and published for a foreign market, would give as much prominence to American topics as American readers might desire. To supply these and other deficiencies the American Editors have inserted about 15,000 titles, arranging the whole, including Chambers's Supplement, in a single alphabet. The total number of titles is now about 40,000. The additions give greater fullness in the departments of biography, geography, history, natural history, and general and applied science. Scrupulous care has been taken not to mutilate or modify the original text of the edition of 1880; no changes have been made except such verbal alterations as are required by the omission of the wood-cuts. The titles of articles from Chambers's Encyclopædia, either from the main work or from the Supplement, are printed in bold-faced type—**AMERICA**. The titles of the American additions, whether of new topics or of enlargements of the old, are printed in plain capitals—**AMERICA**. Should it appear that an article from the English work and its American continuation disagree in any points, the reader will readily refer the conflicting statements to their proper sources.

The labor of consultation will be much reduced by the catch-words in bold-faced type at the top of the page, being the first and last titles of the pages which face each other; and by the full title-words on the back of the volume, being the first and last titles contained therein.

The word *ante* refers to Chambers's Encyclopædia, as represented in this issue. Whenever the word (*ante*) follows a title in the American additions, it indicates that the article is an enlargement of one under the same title in Chambers's Encyclopædia—usually to be found immediately preceding.

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STRANGULATION may be defined to be "an act of violence in which constriction is applied directly to the neck, either around it or in the fore part, so as to prevent the passage of air, and thereby suddenly suspending respiration and life."—Taylor's *Principles and Practice of Medical Jurisprudence*, 1865, p. 673. This definition, as Dr. Taylor observes, obviously includes hanging (q.v.). *Hanging* has been already briefly noticed in a special article, but the medico-legal relations of this and the other varieties of strangulation have still to be considered. The primary cause of death from hanging has been considered in the article just referred to, but it is necessary to add that if a person who has hanged himself has been cut down sufficiently soon to allow of the respiratory process being restored, he is by no means safe; death often taking place from secondary effects at various periods after the accident. The most prominent morbid appearance in these instances was extreme congestion of the brain.

When the suspension of the body has not continued for much more than five minutes, and the parts about the neck have not suffered violence, there is a probability that resuscitation may be established; although many cases are recorded, when after only a few minutes' suspension, it has been found impossible to restore life. It is believed that death takes place very rapidly, and without causing any suffering; the violent convulsions that are so often observed being similar to those which occur in epilepsy. A man named Horushaw, who was on three occasions resuscitated from hanging—a feat which he performed in London for the amusement of the public—stated that he lost his senses almost at once; and other persons who have been restored state that the only symptoms of which they were conscious were a ringing in the ears, a flash of light before the eyes, then darkness and oblivion. The treatment to be adopted after the patient has been cut down may be briefly summed up as follows: exposure to a free current of air, cold affusion if the skin is warm, the application of ammonia to the nostrils, of mustard poultices to the chest and legs, and of hot water to the feet, and the subsequent abstraction of blood if there should be much cerebral congestion; artificial respiration should also be tried if the above means fail to re-establish the respiratory process. From the post-mortem appearances, together with circumstantial evidence, the medical practitioner is not unfrequently called upon to decide such questions as these: Was death caused by hanging, or was the body suspended after death? Was the hanging the result of accident, homicide, or suicide? For the full discussion of these questions the reader is referred to chap. 53 of Dr. Taylor's volume. In case of strangulation from other causes than that of hanging, the post-mortem symptoms are similar, but the injury done to the parts about the neck is commonly greater. In manual strangulation, the external marks of injury will be in front of the neck, about and below the larynx; and if death has been caused by a ligature, the mark round the neck will be circular, whereas in hanging it is usually oblique. The internal appearances are much the same as in the case of hanging.

STRANGURY (Gr. *strangx*, that which oozes out, *oureo*, I micturate) is perhaps to be regarded as a symptom rather than a disease. It shows itself in a frequent and irresistible desire to pass water, which is discharged, however, in very small quantity, and whose passage from the bladder is accompanied with scalding and cutting pains along the course of the urethra. The pain often extends to the bladder and even to the kidneys, and is sometimes so severe as to implicate the lower bowel (the rectum), and to produce the straining condition known as *tenesmus*. It is usually caused by irritating substances in the urine, especially by *cantharides* or Spanish flies (whose irritant principle is liable to find its way into the renal secretion, whether the above named drug is taken internally or merely applied to the skin as a blistering agent), and by oil of turpentine, when administered internally in small doses, and is generally present in cases of gravel. Severe as the affection is, it is very transitory, and yields readily to treatment. After the removal of the cause, if it can be recognized and the removal is possible, a dram of laudanum in a wine-glassful of starch mucilage should be thrown into the lower bowel, and mild mucilaginous draughts (of barley-water, for example) should be

freely given in order to render the urine less irritating. The warm bath is also useful, and if it cannot readily be obtained, hot local fomentations often tend to relieve the pain and allow the urine to pass more freely.

STRANRAER, a royal and parliamentary burgh, sea-port, and market-town of Wigtownshire, at the head of loch Ryan, 6 m. n.e. of Portpatrick. There are no manufactures, the town depending almost wholly on the agricultural interest. The oyster fishery in loch Ryan was at one time very productive, but has latterly fallen off greatly. A mail-steamer runs daily between Stranraer and Larne, in Ireland, in connection with the railways on either side. In 1875, 1258 vessels of 202,770 tons, entered and cleared the port. Agricultural produce and cattle, leather, and shoes are exported. Pop. of royal burgh (1871), 3,615; of parliamentary burgh, 5,941. Stranraer unites with the Wigtown burghs in sending a member to parliament.

STRAP, in carpentry, an iron band fixed round two or more timbers, sometimes with branches along each, to hold them all firmly together.

STRASBOURG (Ger. *Strassburg*), a fortified t., formerly the capital of the French department of the Bas Rhin, but, since 1871, capital of the new German province of Alsace-Lorraine, stands at the confluence of the Ill and the Bruche, and not far from the left bank of the Rhine, 89 m. n. of Basel, and 312 m. e. of Paris by rail. The citadel, originally built by Vauban, 1684, was demolished by the Germans during the bombardment of 1870, but in 1873 they began to rebuild it, and this in conjunction with a system of 12 detached forts, being erected at several miles' distance from the walls, will make the position one of great strength. The most celebrated building is the minster, or cathedral, founded in 1015, which is one of the most sublime specimens of Gothic architecture. Of the two western towers, one, that at the s. corner, has not been completed. The other, finished in 1399, rises, according to Baedeker, to a height of 495 ft. above the pavement—14 ft. higher than the original top of the pyramid of Cheops, while the towers of Cologne cathedral are to be 514 ft. high. The minster has a remarkable astronomical clock representing the planetary system. Other notable structures are the Protestant church of St. Thomas, with the tomb of marshal Saxe, and various monuments to distinguished Strasbourg scholars; the *temple Neuf*, or new temple, the synagogue of the Jews, the town-house, the palace of justice, the arsenal, the episcopal palace, and the theater. The university of Strasbourg was the only complete university in France—i.e., the only one which has the full complement of faculties—besides that of Paris. It was founded in 1621, became specially famous in the branches of medicine and philology, went to the ground during the great revolution, and had its place supplied by an *ecole centrale*. In 1803 a Protestant academy was established with 10 chairs, for teaching theology, philology, philosophy, and history. Five years later, Napoleon founded an imperial academy, with faculties of law, medicine, physical science, and philosophy; and in 1819 a partial fusion of these academies took place, greatly to the benefit of both. The university was reopened after the Franco-Prussian war, in May, 1872. In 1878 it had 624 students. The famous library of Strasbourg, consisting of nearly 200,000 volumes, and rich in *incunabula* (q.v.), was entirely destroyed by fire during the bombardment in 1870, but has been to some extent replaced by a library of about 120,000 volumes contributed by the Germans. The trade of Strasbourg, especially its transit-trade, is very extensive, and it has a great variety of manufactures—beer, ham, sausages, fat-liver pies, watches and clocks, leather, cottons, woolens, silks, cutlery, musical and mathematical instruments, jewelry, brandy, potash, tobacco, etc. The Basel and Baden railways, the railway to Paris, and the communication with Rotterdam and London by means of the Rhine steamers, as well as with the Danube and all the great rivers of France by means of canals, have greatly added to its facilities for conducting commerce. The country round about Strasbourg is fertile and carefully cultivated, with beautiful gardens, mansions, and villages. Pop. (71), 85,529; (75), 92,379, of whom about one-half are Catholics.

Strasbourg, the *Argentoratum* of the Romans, was extant before the time of Cæsar, but is first mentioned by Ptolemy. The Romans had a manufactory of arms here. In the 5th c. it appears to have received the name of *Strata-Burgum* or *Strata-Burgus*, perhaps from the invading Franks, whence the modern German Strassburg and the French Strasbourg. It became a free town of the German empire, and in 1681 passed with the rest of Alsace into the hands of the French, under whom its population and prosperity greatly increased. On Sept. 28, 1870, after a bombardment of seven weeks, Strasbourg surrendered to the Germans, and in 1871 was annexed to Germany.

STRATEGY is defined by military writers to be the science of maneuvering an army out of fire of the enemy, as *tactics* is the art of managing it in a battle, or under fire. Strategy is the greater science, as including all those vast combinations which lead to the subsequent available displays of tactics. A good strategist has to attend to the establishing of his bases and depots, although some brilliant generals have dared to act without these last aids—notably, Sherman in America in 1864, and Wellington in 1813, advancing from Portugal through Spain into France. The strategist must know how to diffuse the influence of his arms over a broad area, while yet holding his force well in hand to strike crushing blows. Such was Wellington's Salamanca campaign; in which,

though retreating himself to his former base, he compelled the French to evacuate Valentia.

Strategy must not be confounded with stratagem, although there is relationship between the two. Stratagem is any device for deceiving the enemy as to the point or strength of an attack. Such are ambuscades, feints, bugle-calls to imaginary troops, concealment of infantry by clouds of cavalry, and many other efforts.

STRATFORD, a thriving t. of Essex, on the Lea, 3 m. e. of London. It is the seat of various and extensive manufactures. There are flour-mills, distilleries, and chemical works. In the town and its suburbs, many London merchants have built residences. The prosperity of the town has been much increased by its connection with the Eastern Counties railway. Pop. '51, 10,586; '61, 15,994; '71, 23,286. On the opposite side of the Lea is the parish of Stratford-le-Bow, or Bow, with (1871) 26,055 inhabitants.

STRATFORD, a t. in s.w. Ontario; co. seat of Perth co., and port of entry; at the junction of the Buffalo and Goderich division with the main line of the Grand Trunk railway; pop. '71, 4,313. It is 88 m. from Toronto, has valuable water-power, and is the center of a fertile agricultural region. It contains the court-house and county offices, a town-hall, 7 churches, 3 newspapers (1 German), a monthly magazine, 3 branch banks, and several hotels. The leading industries are the manufacture of ale and beer, flour, iron castings, machinery, agricultural implements, woolen goods, steam-engines, and boilers, leather, boots and shoes. It contains the railroad repair shops.

STRATFORD-DE-REDCLIFFE, **STRATFORD CANNING**, Viscount, English diplomatist, is son of a London merchant, and cousin of the celebrated George Canning. He was born 1788, educated at Eton, and entered himself of King's college, Cambridge, in 1806, but left in 1807, on receiving an appointment as *précis* writer in the foreign office. He was appointed secretary of embassy at Constantinople in 1809. He returned to Cambridge in 1812 for the purpose of resuming his studies, and took the degree of M.A. He was sent as envoy to Switzerland in 1814. About this time he published an ode full of spirit and power, entitled *Buonaparte*. It is called by lord Byron a "noble poem." In 1820 he went as plenipotentiary to the United States, and remained at Washington three years. In 1824 he was sent on special missions to St. Petersburg and Vienna. In 1825 his introduction to eastern diplomacy commenced with his appointment by Mr. Canning, then foreign secretary, as ambassador-extraordinary to the sublime porte. Here his good offices were warmly exerted on behalf of the Greeks. In 1831 he was accredited with a special mission to Turkey, to fix the boundaries of the new kingdom of Greece, and to settle the treaty in virtue of which Otho ascended the Greek throne. He went to Madrid and Lisbon on a special mission in 1832. He had previously sat in the house of commons for Old Sarum and Stockbridge during a brief interval in his diplomatic career. In 1834 he was elected for King's Lynn, which he represented until 1841, when, having twice refused the governor-generalship of Canada, he was appointed by the government of sir Robert Peel ambassador at Constantinople. Here his influence was strenuously exerted in the cause of civilization and progress. In 1852 the Derby administration recommended the crown to confer upon him the title and dignity of viscount. When the long-standing quarrel between the Greek and Latin monks in Palestine involved the powers of Europe in the struggle, Stratford remembered how the emperor Nicholas of Russia had, from 1829 to 1853, sought to establish a predominant influence, excluding all others, over the porte, with the view of settling the future destinies of Turkey to the profit of Russia when the propitious juncture arrived. At the time when prince Menchikoff was sent to Constantinople upon a mission from the czar, Stratford was absent in England on leave. He returned to Constantinople in April, 1853, and prepared to resist Menchikoff's demands. The keenly contested diplomatic struggle between Stratford and the Russian ambassador extraordinary is narrated with dramatic power by Mr. Kinglake in his *Invasion of the Crimea*, who calls Stratford the "Great Elteli." Stratford's influence with the porte prevailed, for, to adopt the words of Mr. Kinglake, "as though yielding to fate itself, the Turkish mind used to bend and fall down before him;" and he placed on England the responsibility of a defensive alliance with the sultan against the czar. As Russia would not withdraw her troops from the principalities, the sultan declared war against Russia, and France and England came to the aid of the porte. Stratford retired from the Turkish embassy in 1858 upon a pension. He has since taken a frequent part in the debates of the upper house on questions of foreign policy. He was created a knight of the garter in 1869. In 1873 he published *Why am I a Christian?* a work on the evidences of Christianity, and in 1876 a play, *Alfred the Great in Athelney*.

STRATFORD-DE-REDCLIFFE, **STRATFORD CANNING**, Viscount (*ante*). Believing that the independence of Turkey with equal rights to all races and religions would best promote the peace of Europe and the prosperity of the numerous nationalities embraced under Turkish rule, he labored assiduously to promote these objects. For 14 years he not only ruled the empire of Turkey by his personal influence with the sultan Mahmoud, whose throne had just been saved by the intervention of Europe against Mohammed Ali, but also swayed the policy of Europe in regard to the east.

The hattî-houmayoun, which promised so much for civil and religious liberty in Turkey, was his work; and had he continued to represent England in Constantinople, it probably would not have remained a dead letter. He however was withdrawn to please Napoleon, who sought to make French influence predominant in the east. He was an earnest Christian; warmly appreciated the work of the American missionaries in Turkey, and aided them by counsel and influence. He protected the persecuted, founded the Protestant civil community in Turkey, and secured to them whatever privileges they enjoy. He died Aug. 14, 1880.

STRATFORD-UPON-AVON, a municipal borough and township of England, in the county of Warwick, and 8 m. s.w. of the town of that name, is situated on the right bank of the river Avon. Pop. '71, 3,863. The town is neatly built, and has quite a modern look, most of the old houses having disappeared. Some trade is carried on in corn and malt. Stratford-upon-Avon is the birthplace of Shakespeare. The house in which he was born is still preserved, and is visited by enthusiastic pilgrims from all quarters of the world. The great poet is buried in the parish church.

STRATH, a Gaelic word signifying a broad valley, is often prefixed in the n. of Scotland to the names of rivers, as Strathearn, Strathallan, Strathnairn, Strathspey, in each of which cases it signifies the open valley through which the river flows. In such cases, however, as Strathmore (great valley), it simply signifies a valley-like depression. In the s. of Scotland, the word is not used, the Northumbrian word *dale* being used instead, as Clydesdale, Annandale, Teviotdale, Tweeddale.

STRATHAVEN, a t. of Scotland, in Lanarkshire, about a mile w. of Avon Water, and 14 m. s.e. of Glasgow. On the n. side is the picturesque ruin of Avondale castle, and from 5 to 7 m. s.w. are the battle-fields of Drumclog and Loudoun Hill. The more recently built part of the town is neat and spacious. Pop. '71, 3,645, chiefly engaged in weaving and trading in cheese and cattle.

STRATHCLYDE. In the 8th c., the ancient confederacy of the Britains was broken up into the separate divisions of Wales and English and Scottish Cumbria. Scottish Cumbria, otherwise called Strathclyde, thenceforth formed a little kingdom, comprising the country between Clyde and Solway, governed by princes of its own, and having the fortress-town of Alelyde or Dumbarton for its capital. Becoming gradually more and more dependent on Scotland, it was annexed to the Scottish crown at the death of Malcolm I., on failure of the line of native sovereigns. Edgar bequeathed Strathclyde to his youngest brother David, again separating it from the crown of Scotland, which went to his intermediate brother, Alexander I. David held it throughout Alexander's reign in spite of that king's opposition, and on Alexander's death without issue in 1124, it was permanently reunited to the Scottish kingdom under David I.

STRATHMORE (the Great Valley), the most extensive plain in Scotland, is a low-lying tract extending across the country from Dumbartonshire n.e. to Stonehaven in Kincardineshire, is bounded on the n. by the great mountain-rampart of the Highlands, and on the s. by the Lennox, the Ochil, and the Sidlaw hills, and is 100 m. long and from 5 to 10 m. broad. In a stricter sense, however, Strathmore proper extends only from the neighborhood of Perth to that of Brechin in Forfar, a distance of about 40 miles.

STRATHSPEY, a kind of Scottish national dance slower than the reel, which is said to derive its name from having been first practiced in the district called Strathspey.

STRATIO TËS, a genus of plants of the natural order *hydrocharitaceæ*, having a two-leaved spathe with numerous barren flowers, one female flower in each spathe. *S. alvites*, popularly called **WATER SOLDIER**, is common in lakes and ditches in the e. of England. It is a singular plant with numerous leaves, which are strap-shaped, and spring from the root, from which also springs the two-edged flower-stem, bearing the spathe with beautiful and delicate white flowers. In autumn the whole plant disappears, the root alone remaining at the bottom of the water, from which a number of young plants arise in spring, filling up ditches, so that nothing else can grow in them. It is a very ornamental aquatic plant.

STRATUM, pl. *strata* (Lat. strewn or spread out), the term applied by geologists to the layers into which most of the rocks that form the crust of the earth are divided. It implies that the layers have been spread out over the surface, and that they were formed in this way we may infer from the deposits that are now taking place in lakes and seas into which rivers laden with muddy sediment empty themselves.

All the aqueous rocks, which cover so large a proportion of the earth's surface, are stratified. They were formed from the abraded materials of older rocks (aqueous or igneous), which have been washed down and rearranged. The kind of rock produced depended upon the material to which the carrying agent had access. Fine mud would produce shales, sand sandstones, and calcareous matter limestones. In a section, these different kinds of rocks are frequently found to interchange within a short space. This is produced either by the water obtaining different materials, or changing its velocity. Thus the fine sediment which has fallen from slowly flowing water may be covered by a layer of sand brought down by a flood, and this again may have spread over it a covering of shells and corals, and such changes may go on alternately for an

indefinite period. Each of the different beds composed of the same kind of material is called a stratum. Thus, in the series mentioned, there would be a "stratum" of clay, one of sand, and then one of calcareous matter. An assemblage of strata having a common age is called a "formation," and this term is also extended to rocks which agree in their composition or origin. Thus, we speak of stratified and unstratified, aqueous and igneous, fresh water and marine, primary and secondary, metalliferous and non-metalliferous formations. As a formation is composed of many different beds, so a stratum is frequently made up of several "laminæ" or "layers." The laminæ have a more or less firm cohesion, but the strata easily separate from each other. Sometimes the cohesion of the laminæ is so great that it is as easy to split the rock against as with the grain. In such compact rocks the lamination is obscure, or altogether imperceptible in fresh specimens, but whenever they are exposed to the influence of the weather, it becomes obvious. The laminæ have been produced by short interruptions in the deposition, similar to what might be the result of tidal or other intermittent action. The degree of cohesion may be the result of rapid succession in the acts of deposition, but it is frequently produced by metamorphic action subsequent to deposition. The planes of stratification want the complete coalescence characteristic of lamination; when the contiguous layers are closely united, it is the result of the adhesion of two bodies, and not of their coalescence into one.

STRAUBING, a t. of Lower Bavaria, on the right bank of the Danube, 25 m. s.e. of Ratisbon, lies in a very fertile valley, and carries on a river-trade in corn, cattle, and horses. In a little chapel here there is a monument to Agnes Bernauer (q.v.). Pop. '75, 11,590.

STRAUSS, DAVID FRIEDRICH, author of the famous *Leben Jesu*, was b. on Jan. 27, 1808, at Ludwigsburg, in Würtemberg. His education was begun in his native town, and completed in the theological seminaries of Blaubeuren and Tübingen. In 1830, his head filled with Hegel's philosophy and Schleiermacher's theology, he entered on the simple life of a country pastor, but already in the following year he was in Maulbronn acting as professor in the seminary, and went thence to Berlin for six months to continue his Hegelian studies, and hear the lectures of Schleiermacher. Returning to Tübingen in 1832, he became *repetent* in the theological seminary, and in the next years held also philosophical lectures in the university as a disciple of Hegel. Known as yet only to a narrow circle, he became all at once a man of mark by the publication, in 1835, of his *Life of Jesus critically treated* (2 vols. Tüb.; 4th ed. 1840; translated into English, 1846). In this work, written from the point of view of a Hegelian philosopher, and designed only for the learned, he attempted to prove the received gospel history to be a collection of myths gradually formed in the early Christian communities, and, sought by an analytical dissection of each separate narrative, to detect, where it existed, a nucleus of historical truth free from every trace of supernaturalism. The book made a real epoch in theological literature, and produced a violent excitement in and out of Germany, calling forth numberless replies from opponents, frightening many by its bold disregard of consequences back into the ranks of orthodoxy, and stirring up others to similar investigations. The first consequence to the author was his dismissal from his academical position in Tübingen, and transference to the gymnasium of Ludwigsburg. He resigned the new post, however, very soon in 1836, and retired into private life at Stuttgart, to have leisure to defend himself. In 1837 he published his *Streitschriften* against his opponents; and in 1838 *Zwei friedliche Blätter*, a more conciliatory exposition of his views. Early in 1839 he was called by the board of education in Zürich to be professor of dogmatics and church history in the university; but the step raised such a storm of opposition among the public that the proposition had to be dropped, and even the government itself had to resign in the same year. Thrown back on his literary labors, Strauss, who had published during the year his *Charakteristiken und Kritiken*, sent forth shortly afterward his second great work, *Die Christliche Glaubenslehre*, a review of Christian dogma "in its historical development and its struggle with modern science" (Tüb. 1840-41). This formed a natural sequel to the purely critical investigation of the origins of Christianity in the first work. When Strauss, after a long period of silence, next appeared on the literary field, it was no longer as a professed theologian. In 1847 he drew attention by a work entitled, *Der Romantiker auf dem Throne der Cäsaren, oder Julian der Abtrünnige*, full of direct allusions to the political situation of the day. His fellow-townsmen put him forward as a candidate for the German revolutionary parliament of 1848, but he was unable to stand against the clerical influence brought to bear upon the country-people of the district. His speeches on this occasion were published under the title of *Six Theologico-political Popular Addresses*, and his native place compensated the defeat by sending him as its representative to the Württemberg diet. From this position, however, when he unexpectedly displayed conservative leanings, and incurred a vote of censure from his constituents, he retired before the end of the year. A life of the Swabian poet Schubart (1849), and another biographical work, *Christian Märklin, a Picture of Life and Character from the Present* (1851), giving an insight into his own mental development, were his next literary efforts, before another period of silence. His third period of activity was opened in 1858 by a remarkable life of the reformer, Ulrich von Hutten (Eng. trans. 1874), followed up by the publica-

tion of Hutten's *Dialogues* in 1860. These books, though primarily of strictly historical interest, were nevertheless calculated for the present state of religious affairs in Germany, and contained fiercely contemptuous denunciations of the tactics of the reactionary party in the church. A collection of miscellaneous *Minor Writings* appeared in 1862, and a new *Life of Jesus, composed for the German people*, in 1864 (Eng. trans. 1865). The title of the work indicates its popular cast, the peculiar features of it being a long critical statement of the labors of others in the same field down to the present day, and an attempt to construct a life out of all the positive results that have been gained. The mythical hypothesis is retained, but applied differently. Still later publications which appeared in 1865 are *Der Christus des Glaubens u. der Jesus der Geschichte* (Berlin), a criticism of the newly published lectures of Schleiermacher on the life of Jesus, and a brochure, *Die Halben u. die Ganzen*, directed against Schenkel and Hengstenberg. The polemic against Schenkel, professor of theology in Heidelberg, a leader of the liberal party in the church of Baden, and author of the *Charakterbild Jesu* (1864), arose out of an earlier notice of this book by Strauss. In 1872 he published his last work, *Der alte und der neue Glaube*, in which he endeavors to prove that Christianity as a system of religious belief is practically dead, and that a new faith must be built up out of a scientific knowledge of nature. Strauss died in 1874. An edition of his collated works (*Gesammelte Schriften*) began to be published in 1876. The literary, critical, and polemical powers of Strauss must be pronounced to be of the highest order. No more effective German prose than his has been written since Lessing.—See *Life of Strauss*, by E. Zeller (Eng. trans. 1874).

STRAUSS, JOHANN, 1804-49, b. Vienna; was a member of Lanner's orchestra, and then gave concerts with a band he organized in the principal cities of Germany. His three sons have become known as composers of dance music. The eldest son, JOHANN, b. 1825, is music director at Vienna to the emperor of Austria. He organized a band which played with great success in all the large European cities. In 1872 he came to the United States to conduct an orchestra of 1000 performers in his own compositions at the Boston peace jubilee. He composed, besides his well-known waltzes, four operettas: *Indigo* (1871), *Der Carnival in Rom* (1873), *Die Fledermaus* (1874), and *Cagliostro* (1875). The second son, JOSEF, 1827-70, b. Vienna, composed about 300 pieces of dance music.—EDUARD, the youngest son, is the leader of an orchestra in Vienna, and has composed about 260 pieces. Together the four Strausses have published over 1100 compositions, of which those of the younger Johann have become the most popular.

STRAWBERRY, *Fragaria*, a genus of plants of the natural order *rosacea*, suborder *roseæ*, tribe *potentillidæ*, remarkable for the manner in which the receptacle increases and becomes succulent, so as to form what is popularly called the fruit; the proper fruit (botanically) being the small *achenia* which it bears upon its surface. The genus differs from *potentilla* (q.v.) chiefly in having the receptacle succulent. The calyx is 10-cleft, the segments alternately smaller; the petals are five; the style springs from near the base of the carpel. All the species are perennial herbaceous plants, throwing out runners to form new plants; and the leaves are generally on long stalks, with three leaflets, deeply toothed. One South American species has simple leaves. Only one species, the WOOD STRAWBERRY, (*F. vesca*), is truly a native of Britain. It is common in woods and thickets. Its fruit is small, but of delicious flavor. Another species, the HAITBOIS STRAWBERRY (*F. elatior*), is not unfrequently to be seen in woods and hedges, but has probably escaped from gardens. It is really a native of North America. The many kinds cultivated in gardens are regarded as varieties of these species, and of the CAROLINA STRAWBERRY (*F. Caroliniana*), the PINE STRAWBERRY (*F. grandiflora*, or *F. ananas*), and the CHILI STRAWBERRY (*F. Chilensis*), American species, the leaves and fruit of which are larger than those of the wood strawberry. In no genus, however, are the species more uncertain to which the cultivated kinds are to be referred. Some of these are remarkable for the large size of the fruit. New varieties are continually coming into notice, and the utmost care is necessary to keep the larger and finer varieties from degenerating. The cultivation of the strawberry is most extensively carried on in Britain and in Belgium. New kinds are produced from seed; but plantations of strawberries are generally formed of the young plants, which are abundantly produced by runners. The rows are from 18 in. to two ft. apart, according to the kind. The finest fruit is said to be produced when the plants are kept distinct from each other in the rows, but this is not generally done. Tiles are sometimes placed around the plants and under the fruit; and it is an old English practice to lay straw between the rows, to preserve the fruit from rotting on the wet ground, from which the name strawberry has been supposed to be derived; although more probably it is from the wandering habit of the plant, *straw* being a corruption of the Anglo-Saxon *stræc*, from which we have the English verb *stray*. Strawberry beds require to be renewed after a few years. Strawberries are often forced in hot-houses, in order to produce the fruit at a very early season. The uses of the strawberry as a dessert fruit and for preserves are well-known. There is no more wholesome fruit.

The ALPINE STRAWBERRY (*F. collina*), a native of Switzerland and Germany, differs considerably from the other kinds in its taller stems and more erect manner of growth.

The fruit, which is either red or white, is not very large, but is produced in great abundance, and unlike other strawberries, parts from its calyx almost on being touched. The Alpine strawberry continues to produce fruit long after the other kinds.

The INDIAN STRAWBERRY (*F. Indica*), a native of the Himalaya, requires only a little protection in Britain from severe frost, and with this care grows luxuriantly and produces fruit in abundance. The flowers are yellow, not white, as in other strawberries, and are not produced upon common flower-stalks rising from the center of the plant as in the other species, but upon single-flowered stalks, which spring from the axils of the leaves upon the runners. The fruit is very beautiful, growing with its apex upward. It is not, however, of good quality.

STRAW-MANUFACTURES. The industrial applications of the straw of wheat are of great commercial importance, especially that of plaiting, which is one of the oldest arts practiced by mankind, many specimens having been found in the tombs of the ancient Egyptians, and mention being made of plaiting by Herodotus and other early writers. The earliest notice we have of its systematic use in Europe as an article of clothing is in the records of the reign of Mary, queen of Scots, who, we are told, observed that the peasants of Lorraine wore hats made of straw plait, and that this manufacture was beneficial to them, and she consequently conceived the idea of introducing it into Scotland, which was done about the year 1562, but without much success. Her son, James I., however, carried it into England, where it soon thrived, and has been from that time a permanent branch of industry. It was first regularly established in Bedfordshire, which has ever since been the chief seat of the trade.

At first, the plait was what is called *whole straw*; that is, the straw was cut into suitable lengths without knots, and merely pressed flat during the operation of plaiting, and so it continued until the reign of George I., when it was in great demand for ladies' hats, and some plait was made of split straw. Since that time, this kind has been chiefly used, and a much improved method has been substituted for the clumsy one of using a common knife for splitting it. The instrument now employed is made of steel, and consists of a number of little square blades set in a circular manner around a stem, which at one end terminates in a point, and at the other is bent and fixed into a handle. The point being inserted into the hollow of the straw, is pressed forward, and cuts it into as many strips as there are blades in the cutting-tool; these vary in number according to the fineness of the work to be produced.

It is found that the fine straw-plaiting, which is now produced better in England than in any other country except Italy, can only be made from one or two varieties of wheat, that called the White Chittim being generally preferred, and next to it the Red Lammas, which only succeed as a straw-crop upon the light rich soils of the more southern of the midland counties. The harvesting is a matter of great anxiety, as the straw is liable to many injuries from wet and other causes. The value of this crop can be best understood by the fact that an acre will yield from 25 to 40 bushels of wheat, and from 15 cwt. to a ton of straw, which, when in good condition, is worth £7 or £8.

The crop is bought up by straw-factors, who employ people to draw the straw, and remove the ears, which are all cut off by hand for threshing. The straws are afterward cut into lengths and cleared of the outer sheath or leaf; they are then sorted into various thicknesses by an apparatus consisting of a series of sieves about eight inches in diameter; the boys who usually do this work hold a handful on end over the first sieve, which has the narrowest spaces, and the thinnest straws only fall through it; they are next placed on the second, and so on to the last. As they fall through each successive sieve, they pass down through hollow shafts, through shoots of tin or sheet-zinc into boxes, from which they are removed and tied into bundles ready for the splitters, who next take them in hand and reduce them to strips of the sizes required.

The plaits are made by women and children in their own cottages, and are collected by the dealers and sold in the Luton and Dunstable markets, in which the chief part of this business is transacted. They are very various in pattern, and are sold by the score of 20 yards, the prices ranging from 2d. to 3s. per score for the ordinary kinds, but very fine plaits have been known to fetch as high as £3 to £4 per score.

It is computed that 70,000 persons are employed in this trade, of whom nearly 60,000 are females and boys, and that they produce annually about 13,000,000 scores, or 240,000,000 yards of plait. The plait is made up into bonnets and hats chiefly at Luton and Dunstable, and sent up to the London warehouses for sale, whence they are sent to all parts of the world. A large trade is also done in the fine plaits of Tuscany; the Lehigh plaits are very fine, and fetch high prices.

Besides its value for plaiting, straw is now much used in the manufacture of paper (q.v.).

STRAW MANUFACTURES (*ante*). From a very early period in the colonial times, the plaiting of straw and its manufacture into suitable goods for domestic use was a common home industry in many New England and other northern households. As these goods were necessarily crude and ungraceful, the wants of the wealthier classes were usually supplied by importation from abroad—principally from Italy. In the early part of this century, however, when the protracted European wars cut off communication with Italy, more attention began to be paid to this branch of industry, and

various manufactories were started which supplied a limited and local trade. But it was not until 1825-30 that the business grew to any real importance or covered any great extent of territory. About that time some of the more enterprising New York and Massachusetts houses sought to develop their facilities so as to reach those portions of the country where straw goods were little known, and the business soon assumed immense proportions. For many years goods were made largely from the straw raised and plaited in this country—the plaiting being done chiefly by females during the intervals of household work—but the cheapness and superiority of foreign braids, in some cases, again drove this form of American labor out of the market. The chief domestic braids now left are the “Mackinaw” straw, which is raised and plaited in Canada and in a few localities in the north-western states, and the palm-leaf, grown in Cuba and split and braided in New England. More than 50 per cent of all the straw goods manufactured in this country are made from the Canton straw imported from China. The Luton straw from England, and the Leghorn from Italy, are also largely used, and small quantities of other varieties are imported from Switzerland, Bohemia, France, Malaga (Spain), Manila, and Central and South America. The total value of the importations is estimated at about \$2,000,000 annually. Straw hats and bonnets are sewn chiefly by the Knowlton and Bosworth sewing machines, which are run by steam and which can turn out as many as 100 hats each in a day. These machines are of American invention and their use is gradually extending abroad. The goods are pressed and blocked into shape at the rate of four a minute, by another machine of American origin. The total value of the straw goods manufactured in the United States, was, in 1860, \$4,395,616, and in 1870, \$7,282,086. The increase in the last ten years has been even more rapid, but the official figures have not yet been published. More than one-half of the entire amount of American straw goods are manufactured in Massachusetts alone, the census of 1870 valuing the products of that state at \$4,869,514, the remainder being divided among the following eight states: Connecticut, \$1,026,000; New York, \$1,006,000; Pennsylvania, \$189,242; California, \$60,700; New Jersey, \$54,530; Rhode Island, \$40,000; Wisconsin, \$34,500; Vermont, \$1,600.

STRAZNICKY, EDWARD R., PH.D., 1820-76; b. Moravia; graduated at a university in Vienna, where he became an expert linguist, and took the degrees of M.D. and PH.D. He was made intendant of an estate belonging to a wealthy Austrian nobleman, but, becoming involved in the struggle of Hungary for liberty, was compelled to leave his country, notwithstanding the fact that one of his near relatives was a field-marshal in the Austrian service. He arrived in New York penniless, and was forced to submit to severe privations during his first years in America. His ability and education, however, at length secured him influential friends, and he was made secretary of the American geographical society, and in 1859 second assistant librarian in the Astor library. He rose through the different grades until, on the retirement of hon. Francis Schroeder, superintendent of the library, he was appointed to that position, which he held until his death.

STREET, ALFRED BILLINGS, 1811-81; b. N. Y.; studied law and practiced a few years at Monticello, N. Y., but after 1838 lived at Albany. He wrote many poems of considerable merit, some of which have been translated into the German. Among his writings were: *The Burning of Schenectady, and other Poems* (1842), and *Frontenac, a Tale of the Iroquois in 1696* (1849). In prose, he wrote biographical and historical sketches, *Forest Pictures in the Adirondacks* and *The Indian Puss* (1869). He was for many years state librarian.

STREET, AUGUSTUS RUSSELL, 1791-1866; b. New Haven, Conn.; graduate of Yale college, 1812; studied law; inherited a large estate; gave \$300,000 to Yale college, founding the Street professorship of modern languages. He erected, and partially endowed, the Yale school of fine arts, and left a sum of money to establish the Titus Street professorship. He lived in Europe, 1845-48; returned to this country and died in New Haven. His daughter married admiral Foote.

STREET, GEORGE EDMUND, b. England, 1824; educated at the collegiate school, Camberwell, and afterward studied architecture under G. G. Scott. Among his works are the theological college at Cuddesden, and the churches of St. Philip and James, at Oxford, and of St. Margaret, at Liverpool. Among his restorations are Jesus college chapel, Oxford; and Wantage church. Most of his works are in the Gothic style, upon which he has written much. Among his writings are *The Brick and Marble Architecture of North Italy in the Middle Ages* (1855), and *Gothic Architecture in Spain* (1865).

STRELITZ, more properly *streltzi* (arquebusiers), the ancient Russian militia-guard, first raised by Ivan Vassilevitch the terrible, in the second half of the 16th century. At that time, and for long afterward, they were the only standing army in Russia, and at times amounted to between 40,000 and 50,000 men. They were located at Moscow in time of peace, in a quarter of the capital which was set apart for them, and, being the bravest and most trustworthy troops in the army, were made objects of special favor and distinctions. But like all such petted corps, the Roman pretorians, the Turkish janizaries, and the Egyptian memlucs, their general turbulence, frequent revolts against the government (notably during the Demetrian insurrections), and incessant conspiracies

rendered them more formidable to the Russian government than to external enemies. The strelitz having, at the instigation of the grand-duchess Sophia and the chiefs of the Old Muscovite party, revolted against Peter the great, that iron-handed ruler caused them to be decimated (1698) in the great square of Moscow, and the remainder to be banished to Astrakhan. The feeble remnant still manifesting their characteristic turbulence and disloyalty, Peter exterminated them almost completely in 1705. Few Russian families at present can claim kindred with the old streltzi, but to this the family of Orloff (q.v.) forms a prominent exception, being descended from a strelitz who was pardoned by Peter the great while the axe was being raised over him.

STRENGTH OF MATERIALS. The strength of materials depends upon their physical constitution—viz., their form, texture, hardness, elasticity, and ductility.

The resistance of materials in engineering works is tested in reference to various strains; such are—1. Extension or tension; 2. Compression or crushing; 3. Transverse or cross strain; 4. Shearing strain; 5. Torsion or twisting strain.

1. *Extension.*—When a rod is suspended vertically, and a weight attached to its end tending to tear it asunder, all its fibers act equally, and its strength evidently depends on the strength of the individual fibers and their number, that is, the area of cross-section of the rod. The following table gives the resistance to *rupture* of some of the most common materials:

	Per Square Inch.
Fine sandstone.....	200 lbs.
Brick.....	300 "
Common lime.....	50 "
Portland cement.....	240 "
Deal (timber).....	5 tons.
Cast iron (ordinary).....	6½ "
" Stirling's toughened.....	12½ "
Wrought iron, boiler-plate.....	20 to 24 "
" bars.....	25 "
Cast steel.....	60 "
Ropes (hemp), four-fifths ton per pound weight per fathom.	

With regard to the elongation of materials under tensional strain, it has been observed that up to a certain limit, which is different for different substances, the elongation is proportional to the extending force, a physical truth the promulgation of which is due to Hooke (q.v.); up to this limit also the body nearly recovers its original form on the removal of the force: this limit is called the limit of elasticity. When this limit is passed, the permanent elongation or destruction rapidly increases until rupture takes place.

The extension of wrought iron is about $\frac{1}{100000}$ of its length per ton of strain per square inch, and that of cast iron $\frac{1}{80000}$. The limit of elasticity of wrought iron is attained under a strain of 12 tons per square inch; and in the case of American pine $\frac{1}{4}$ ton per square inch.

2. *Compression or Crushing Strain.*—The strength of pieces of stone, wood, or iron, whose height is small in proportion to their area, and which absolutely crush under the strain, is proportional to the area of their horizontal section. The following table gives the resistance to crushing of some of the more common materials:

Cast iron.....	50 tons per square inch.
Wrought iron.....	16 " " "
Brickwork.....	30 tons per square foot.
Sandstone.....	200 " " "
Limestone.....	490 " " "
Deal.....	450 " " "
Oak.....	650 " " "

Up to a certain strain, which is called the limit of elasticity, the diminutions in length of the body are proportional to the compressing force; and are practically the same in amount as the elongations in the case of tensional forces. In the case of wrought iron, the limit is 12 tons per sq. in.; after that strain, its shape and proportions become permanently altered; and where these are of consequence, as in most practical cases, we come to the limit of its utility, which is reached when the load is about 16 tons per sq. inch. It then oozes away beneath additional strain, as a lump of lead would do in a vise.

The mode of ultimate failure of cast iron is quite distinct from that of wrought iron. It crushes suddenly by the sliding off of the corners in wedge-shaped fragments, being a crystalline mass, without sufficient ductility to allow of its bulging horizontally; the angle of rupture at which these wedges slide off being tolerably constant, and varying from 48° to 58°. The limit of elasticity is attained in cubes of deal under a compression of 100 tons per sq. ft.; and in those of oak, 150 tons per sq. foot.

Pillars, round or square, may be divided into three classes—1. Those whose height is not more than 5 times their diameter; 2. Those whose height is between 5 and 25 times their diameter; 3. Those whose height is at least 25 times their diameter. The

first follow the same laws as cubes or pieces of small height above discussed, and are absolutely crushed; their strength being proportional to their cross section. The second are broken across, partly by crushing and partly by bending. The third give way purely from bending as with a transverse strain, and their strength is found by experiment to be directly proportional to the fourth power of their diameter, and inversely proportional to the square of their length. Thus, in the case of two long pillars of equal length, but of which one has its diameter double that of the other, the strength of the former will be 16 times that of the latter; from which will be apparent the advantage of the tubular form for pillars, as it gives a large diameter, combined with lightness.

In the case of long columns whose length is 25 or more times their diameter, if we represent the strength of a long cast-iron column of any dimensions by 1000, the strength of a wrought iron column of the same dimensions will be 1750; of cast steel, 2,500; of Danzig oak, 110; of red deal, 80.

3. *Transverse or Cross Strain.*—When a beam fixed at one end is loaded with a weight at the other, it is bent from its original form, and takes a curved shape. The fibers on the upper or convex side of the beam are extended, and those on the under or concave compressed; while at the middle of the beam, there are fibers which are neither extended nor compressed, where the compression ends and the extension begins: this surface of fibers is called the neutral surface. As long as the beam is not strained beyond the limit of its elasticity, the extensions and compressions for a given strain are nearly equal, and therefore the neutral surface passes through the center of gravity of the cross section of the beam.

If we strain the beam beyond this limit, and approach the breaking strain, the extensions and compressions are no longer equal, and therefore the position of the neutral surface is not readily determined. For example, in the cases of stone and cast-iron, the amount of compression is much less than that of the extension, and in the case of timber greater. Also the extensions and compressions are no longer proportional to the strains. From these causes the position of the neutral axis, and the amount of strain on the different parts of the cross section at the moment of rupture, cannot be determined by theory.

Different theories have been proposed to determine the relative strength of similar beams, while their absolute strength is left to experiment. That of Galileo consists in supposing the beam incompressible, and that it gives way by extension turning round the lower edge, each point of the section giving an equal resistance before rupture. That of Mariotte and Leibnitz supposes the beam in like manner to turn round its lower edge, but considers that the resistance given out by each point of the section is proportional to its distance from that edge.

The theory now generally adopted consists in supposing the extensions and compressions to continue up to the point of rupture proportional to the strains, as is actually the case up to the limit of elasticity, and therefore, that the beam turns round a neutral axis, passing through the center of gravity of the cross section, the force given out by each point being proportional to its distance from the neutral axis. This last theory is found to give the best results in the case of timber and wrought-iron, especially wrought-iron arranged in the forms usual in girders. The second represents nearly the method of failure of stone, and the first that of cast-iron.

Though none of these theories give accurate results, they yet give us means of determining, from particular experiments, the strength of any other beam whatever. For example, these theories agree in giving the strength of a rectangular beam to be proportional to the area of cross section multiplied by the depth, and inversely proportional to the length of the beam, since the strain increases directly as the length. This, when expressed mathematically, is

$$W = C \frac{bd^2}{l} \quad (I.)$$

Where w = breaking weight in tons.

b = breadth of beam in inches.

d = depth of beam in inches.

l = length of beam in inches.

C = a constant number for beams of the same material, to be determined by experiment.

This result is borne out by experiment—that is to say, the constant C being determined by experiment on one beam, the strength of any other is found by multiplying its breadth by the square of its depth and by the constant C , and then dividing by its length. In the case of a beam supported at each end and loaded by a weight in the middle, the strength is also given by the formula,

$$W = c \frac{bd^2}{l} \quad (II.);$$

but c , in this case, is 4 times the value of C in the formula for a beam loaded at one end

The truth of this may be seen from the consideration that the beam may be treated as if it were two beams, each fixed at the middle point at one end, and pressed upward by the reaction of the supports at their other ends. This reaction is evidently equal to $\frac{W}{2}$; so that the breaking weight of the whole beam, supported at both ends, resolves itself into that of a beam of length $\frac{l}{2}$, acted on by the weight at one end $\frac{W}{2}$; this by formula (I.) is,

$$\frac{W}{2} = C \frac{bd^2}{\frac{l}{2}}$$

$$\text{or, } W = 4C \frac{bd^2}{l} = c \frac{bd^2}{l};$$

therefore, $c = 4C$ or $C = \frac{1}{4} c$.

Experiments on the transverse strength of beams are generally made by loading in the middle beams supported at both ends. The following table, from experiments by Mr. Barlow, gives the value of c for beams supported at each end and loaded in the middle:

	Tons.
Cast-iron.....	13½
Wrought-iron.....	12
English oak.....	2½
Red pine.....	2½

These numbers when substituted in the formula give the breaking weight, one-third of this will be the safe load in practice. The transverse strength of cast iron is considered so good a test of its value, that in specifications of iron work, it is generally required to be of such a quality that a bar of it, of certain dimensions, will bear a specified weight at the center; for example, "that a bar of it, 42 in. long, 2 in. deep, and 1 in. wide, set on bearings 36 in. apart, shall bear, without breaking, 30 cwt. suspended in the middle." If a beam be loaded uniformly over its length, it will bear twice as much as if the load be condensed at the center. Also if the load be placed some distance from the center, the load it will bear is to the load borne at the center inversely as the rectangle of the segments into which the beam is divided by the point of application of the load are to one another, from which it follows that it will bear less weight at the center than at any other point.

Since the strength of a rectangular beam is proportional to the square of the depth, multiplied by the breadth, it is evident that by increasing the depth and diminishing the breadth we shall, up to a certain limit, increase the strength of a beam without increasing its weight; for example, let A and B be the sections of two beams, of which A is 2 in. broad and 2 deep, and B 4 in. deep and 1 in. broad, they are of the same sectional area—viz., 4 sq.in., but the strength of B is to the strength of A as $4^2 \times 1$ is to $2^2 \times 2$, or as 16 to 8, that is 2 to 1, that is to say, B is twice the strength of A. Hence arises the advantage of the double T forms so generally used in iron girders, the strength of which forms are proportional to the area of the top or bottom plates multiplied by the depth. For a beam of this form loaded at the center, the following formula will give the breaking weight:

$$W = C \frac{ad}{l}$$

Where a = the area of the top or bottom flange in sq. inches.

C = { 4 times the destroying load per sq.in. of the material, under direct ten-

sion or compression in tons.

d = depth of the beam in feet.

l = length between supports in feet.

W = breaking weight at the center in tons.

For cast-iron beams, when the area of the bottom flange is made 6 times that of the top, which has been found by experiment to be the best arrangement, and the strength is measured by the tensional strain, supported by the bottom flange, that is, $6\frac{1}{2}$ tons per sq. inch.

$$C = 6\frac{1}{2} \times 4 = 26 \text{ tons.}$$

For wrought-iron beams,

$$C = 4 \times 20 = 80 \text{ tons for the lower flange,}$$

$$\text{and } C = 4 \times 16 = 64 \text{ tons for the upper flange.}$$

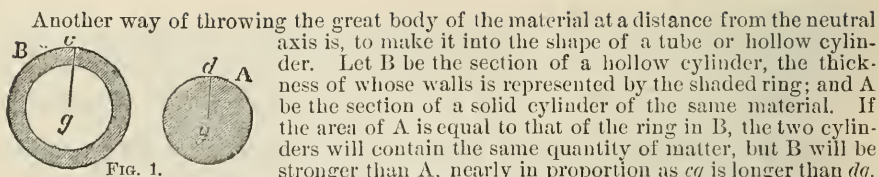


FIG. 1.

The principle of hollow structure prevails both in nature and art, wherever strength and lightness have to be combined. It is seen in the stems of plants, especially of the grasses; the bones of animals are also hollow, and those of birds, where great lightness is required, are most so. A feather, with its hollow stem, is perhaps the best instance of the union of strength and lightness that could be given. In art, again, we have hollow metal pillars; and sheet-iron for roofing and other purposes is *corrugated*, or bent into ridges and furrows, to give it depth. Each ridge or furrow is, as it were, half a tube, and resists bending with twice or thrice the energy it would if flat.

The most striking application of the principle of hollow structure is seen in tubular bridges. The object being to resist a vertical strain, the form is made rectangular, and the chief mass of the material is thrown into the top and bottom. The tube may, in fact, be considered as an immense beam or girder constructed on the principle of the double T-iron girder, the top and bottom being the two flanges, and the two sides serving to connect them instead of the one rib in the middle. As it is constructed of plate-iron, the top requires more metal than the bottom, in order to resist the compression; but instead of putting the metal into one thick plate, or into several plates, laid the one on the other, it is made to form a set of minor tubes or cells, which give additional stiffness and strength to the whole tube. The floor, in like manner, contains cells. Each of the tubes over the Conway bridge is 24 ft. high, 14 ft. wide (outside), and 420 ft. long, and weighs 1,300 tons; yet these enormous hollow beams sustain not only their own weight, but the heaviest railway-trains without sensible deflection.

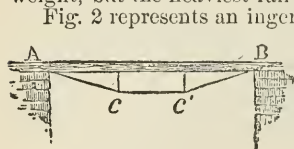


FIG. 2.

Fig. 2 represents an ingenious contrivance for strengthening the wooden beams supporting a bridge. An iron rod fixed to the beam AB at the two ends, is kept at a distance by struts c, c' . The beam cannot now be bent downward without stretching the rod; which thus has to bear the tensile strain while the beam itself sustains only the compressive strain.

Another way of removing part of the strain from a girder, is to fix a king-post and two oblique pieces on its upper side. The whole is now one composite girder; and

when any weight bears upon it, the whole of the compressive strain is thrown upon the oblique pieces, and only the tensile strain is left for the beam to sustain.

When a beam AB is fixed at one end, and loaded at the other, the strain is greatest at B, and is less at other points c, c' , in proportion as Ac, Ac' , the levers at which it acts, are less than AB. The beam may therefore be made to taper off toward the end, and we may determine the exact form the beam should have, in order to be equally strong at every point. For supposing the breadth uniform, the strength increases as the squares of the depths $c'd', cd$, while the strain increases as the levers Ac', Ac ; and thus, if $Ac : Ac' :: cd^2 : c'd'^2$, the strengths are equal at those points. This proportion will always hold good, if the curve of the beam is that of a parabola; and, accordingly, this is the shape given to the beams of steam-engines.

In beams supported at both ends, the strain is greatest in the middle; girders are therefore made strongest in the middle, and taper toward the ends.

4. *Shearing Strain.*—This force is called into play when a plate is cut by shears, or when a riveted or bolted joint is torn asunder, in which case the rivets are sheared across. The effect of it is to cause the particles in one plane to slide over those in another; this is resisted by their mutual coherence, and the magnitude of the resistance depends on the number of the particles, that is on the area of cross-section of the body sheared. The following laws are the result of experiment: 1. The ultimate resistance to shearing is proportional to the area of section of the bar sheared. 2. The ultimate resistance of any bar to a shearing strain is nearly the same as the ultimate resistance of the same bar to a direct longitudinal strain.

5. *Torsion.*—If one end of the axle or shaft of a wheel is immovably fixed, and a power acts at the circumference of the wheel (or at the end of a lever or winch), the power may be so increased as to twist the shaft asunder at its weakest point. If a shaft A has twice the diameter of another shaft B, there will be four times as many fibers in the section of fracture of A, to resist the twist, as in that of B. But as the separation takes place by the one end of the fracture turning round upon the axis of the shaft, making the ends of the separating fibers describe circles, those fibers that are furthest from the center will have the greatest power of resistance, and the sum of their moments,

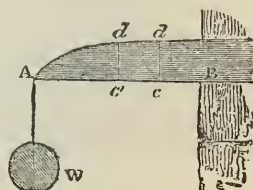


FIG. 3.

or their united effect, will be in proportion to their mean distance from the center. This mean distance in A is twice that in B; therefore, the resistance in A is 2×4 , or 8 times the resistance in B. Generally, *the strength of shafts to resist torsion is as the cubes of their diameters*. The torsive strengths of shafts 1 in. diameter, and with weights acting at 1 ft. leverage, being found by experiment for different materials; the strength of shafts of other dimensions is found from these "constants" by multiplying by the cube of the diameter, and dividing by the length of the lever. It is evident that the torsive strength of a hollow shaft will be greater than that of a solid one of the same quantity of material, on the same principle that its transverse strength is greater. The rule used by Boulton and Watt for calculating the diameters of their wrought-iron shafts was as follows:

$$\text{Diameter of shaft in inch.} = \sqrt[3]{\frac{120 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

This is found to make the shafts rather too light; and the following variation gives safer practical results:

$$\text{Diameter of shaft in inch.} = \sqrt[3]{\frac{240 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

STREPSIP TERA (Gr. twisted-wings), an order of insects called RHUPIPTERA (Gr. fan-winged) by Latreille, but first established by Kirby. The first-known species were observed by Rossi, and referred by him to the order *hymenoptera*. The order strepsiptera consists of a small number of species, very singular in structure and habits, apparently forming a connecting link between *coleoptera* and *hymenoptera*. The species are all small, and in their larval state, live parasitically in the bodies of bees and wasps. Their natural history has been the subject of much attention since they were discovered; but much still remains obscure. The species form the two genera, *stylops* and *zenos*.

STRETCHING-COURSE, in masonry or brick-work, is a course in which the stones or bricks are placed with their longest sides along the face of the wall. The stones are called *stretchers*, as those placed at right angles to them with their end exposed are called *headers*.

STRETTO (Ital. bound), in music, a term which signifies that the movement to which it is prefixed is to be performed with rapidity gradually accelerating toward the close.—The term *stretto* is also applied to the recurrence in a fugue of the subject in one part before it has come to a close in another. See **FUGUE**.

STRIAE, the fillets between the flutes of columns, pilasters, etc.

STRICKLAND, AGNES, an English authoress, the daughter of Thomas Strickland, esq., was b. at her father's seat, Reydon hall, near Southwold, in Suffolk, in the year 1806. She was the third daughter of a family of six daughters and two sons, nearly all of whom have contributed something to the literature of our time. Her first compositions were mostly in the poetical vein, and consisted of anonymous contributions to periodicals. About the year 1825, however, she published, in conjunction with her sister Susanna (afterward Mrs. Moodie), a volume of *Patriotic Songs*; which was followed, in 1826, by a little volume bearing her own name exclusively, and entitled *Worcester Field, or the Cavalier; a Poem, in Four Cantos, with Historical Notes*, which was favorably received by some of the reviews. *Worcester Field* was followed by *The Seven Ages of Woman, and other Poems* (Lond. 1827); and this by *Demetrias, a Tale of Greece, in Three Cantos* (Lond. 1833), written in the meter of Byron's *Corsair*. In 1836 she published a little volume entitled *Floral Sketches, Fables, and other Poems*; republished in 1861. With this the list of Miss Agnes Strickland's poetical works ends. Among her prose works are: *The Rival Crusoes*, published without date; *The Pilgrims of Walsingham, or Tales of the Middle Ages, an Historical Romance* (2 vols., 1835); *Tales and Stories from History* (1836); *Alba, the British Captive* (1841); *Historical Tales of Illustrious British Children* (1847; new ed., 1858); *Historic Scenes and Poetic Fancies* (1850); *Old Friends and New Acquaintances* (2 series, 1860-61). All these, however, are but of small import in comparison with her well-known work, *Lives of the Queens of England from the Norman Conquest, with Anecdotes of their Courts*, in 12 vols. (Lond. 1840-48; new ed., 8 vols., 1851-52). In this work, the materials for which she discovered by diligently ransacking among the treasures of the British museum and other great public repositories of historic documents, Miss Strickland was largely assisted by her sister Elizabeth, an assistance which she gratefully acknowledges in her preface. It was dedicated to queen Victoria; and as each volume successively appeared, its picturesque style and anecdotal character made it a general favorite, especially among that class of readers whose object in reading history is rather amusement than philosophical instruction. At the same time it must be owned that in these *Lives* she has added materially to our stock of historical information. Miss Strickland's *Lives of the Queens of England*, concluding with the biography of queen Anne, have been followed by the *Lives of the Queens of Scotland, and English Princesses connected with the Royal Succession of Great Britain*, in 8 vols. (Edin. and Lond. 1850-59); and these by her *Lives of the Bachelor Kings of England* (Lond. 1861), containing the lives of William Rufus, Edward V., and Edward VI. Miss

Strickland published a novel entitled *How will it End?* (1865); *Lives of the Seven Bishops* (1866). In 1871 she received a pension of £100. She died in July, 1874.

STRICKLAND, HUGH EDWIN, 1811-53; b. England; studied with Dr. Arnold at Laleham; graduate of Oxford, 1832; gave his attention to the special study of geology and ornithology. In 1850 he became reader in geology in the university of Oxford, succeeding Dr. Buckland, and retaining the post till his death. He was one of the founders of the geological society, and of the Ray society, which on account of his representations undertook the publication of Agassiz's *Bibliographia Zoologie et Geologie*, 3 vols. of which he edited. He contributed to scientific periodicals, and was associated with sir Roderick Q. Murchison in his *Silurian System*. He was killed by a railway train while making investigations near Claborough tunnel, on the Gainsborough and Retford railway.

STRICTURE is a term employed in surgery to denote an unnatural contraction, either congenital or acquired, of a mucous canal, such as the urethra, œsophagus, or intestine. When, however, the affected part is not mentioned, and a person is stated to suffer from stricture, it is always the urethral canal that is referred to. Contraction of this canal may be either permanent or transitory; the former is due to a thickening of the walls of the urethra, in consequence of organic deposit, and is hence termed organic stricture; while the latter may be due either to local inflammation or congestion, or to abnormal muscular action; the first of these varieties may be termed inflammatory or congestive stricture; and the second, spasmodic stricture. The last-named form seldom exists except as a complication of the other kinds of stricture. There are two principal causes of organic stricture—the first being inflammation of the canal, and the second injury by violence. Inflammation is by far the most common cause, and gonorrhœa is the common agent by which it is excited. Not unfrequently, stimulating injections thrown into the urethra, with the view of checking the gonorrhœal discharge, excite an inflammatory action, which gives rise to stricture. Fortunately, it is only in exceptional cases that a stricture results from inflammation of the urethra, the inflammation, in the great majority of cases, terminating by resolution, and leaving the canal as healthy as before the attack. It is when the complaint assumes a chronic character that it most commonly lays the foundation of stricture. Stricture from the second cause arises from such cases as falling across spars, scaffolding, ladders, etc., or on some sharp object which punctures the perineum, as from earthenware vessels which break under the sittr.

The earlier symptoms of stricture are a slight urethral discharge and pain in the canal, behind the seat of the stricture, at the time of micturition. The stream of urine does not pass in its ordinary form, but is flattened or twisted; and as the disease advances, it becomes smaller, and ultimately the fluid may only be discharged in drops. The straining efforts to discharge urine often induce tenesmus (q.v.).

As the case advances, the urine becomes alkaline and ropy, and deposits a precipitate when allowed to stand; and attacks of complete retention (q.v.) occur with increasing frequency. But these symptoms are not in themselves sufficient to establish the presence of stricture. It is necessary to examine the urethral canal with a catheter (q.v.) or bougie (q.v.), to ascertain whether an organic obstruction exists, whether one or more strictures are present (as many as eight have been recorded, although four are rare; and one is the most common number), and their caliber. The treatment of organic stricture is too purely surgical to be discussed in these pages: it is sufficient to state that its object is twofold, viz., first, to restore the natural caliber of the canal, so far as this can be safely effected; and, secondly, to maintain this patency, after it has been established.

Spasmodic stricture may occur from any of the following causes: The presence of organic stricture or of inflammation of the mucous membrane; from an acrid condition of the urine; from the administration of cantharides, turpentine, etc.; and from the voluntary retention of urine for too long a time. The treatment consists in the removal of the causes as far as possible, and the hot bath. The inhalation of chloroform sometimes gives immediate relief; and several cases are recorded in which, when the spasm occurred periodically, it was cured by quinine. Inflammatory or congestive stricture commonly arises when a recent purulent discharge from the urethra has been checked by external cold or wet. The patient complains of heat, fullness, and soreness in the perineum; the passage of the urine is extremely painful, the stream being small, and ceasing before the bladder empties. The treatment is much the same as that for retention of urine (q.v.).

STRIGAU, or STRIEGAU, a t. of Prussia, province of Silesia, and government of Breslau, is situated on Strigau Water, 32 m. w.s.w. of Breslau. It has manufactures of woollens and lincens. Pop. '75, 10,614.

STRIGIDÆ, the family of nocturnal birds of prey, or owls (q.v.).

STRIKE, a term borrowed by geologists from the German *streichen*, to extend, and adopted with the technical meaning it has in that language. It is applied to the direction of the outcrop of a stratum—the line which it makes when it appears on the surface of the earth. This line is always at right angles to the dip of the bed. The angle of dip and the direction of strike are determined by a clinometer and compass. A perfectly horizontal stratum can have neither dip nor strike.

STRIKES. Beginning as early as the middle of the 14th c., the opposition of combined labor to the efforts of employers to regulate the price and hours of labor, has been prominent in economic history; though, indeed, the earliest incident recorded in such history, had a peculiar origin, the reverse of what we have just indicated. The terrible plague of 1348 which continued during eight years, destroyed, it is believed, nearly two-thirds of the human race then existing. In London, 50,000 bodies were buried in one grave-yard; in Venice the number of deaths is said to have been 100,000; in Lübeck 90,000; in Spain the disease raged three years, and carried off two-thirds of the people; in the east 20,000,000 perished in one year. One result of this protracted "dance of death" was a scarcity of labor so great that it became a question as to the possibility of providing for the living. Such a condition, not unnaturally, encouraged the craftsmen to increase the price of their services, with the increase of the demand and of the scarcity. In England this assertion of a claim which could not but be obnoxious, was met by parliamentary enactments, "statutes of labor," and other exercise of the power of the governing class. It was the first "strike," and, as ever since, it was met by force. It was an attempt to take unfair advantage of disaster and death. Subsequent strikes for a rise in wages have been occasioned mostly by a preceding act of cutting them down. The introduction of machinery and the factory system into British labor, was the occasion of serious resistance on the part of skilled labor; as was the case also on the continent of Europe and in America. From this time strikes have been common, whenever laborers wished an increase of wages, or a lessening of the hours of labor. The organization of trades-unions made it possible to conduct these movements on a large and powerful scale; and in many instances—particularly in flush times, and when prices were high—they were successful. Not always conducted, however, with a due regard for existing economic conditions, they have frequently proved abortive for their purpose, and powerful only in creating added and permanent distress among the laboring classes. Little record has been kept of the strikes which have occurred in America, but we know that as early as 1830 they occurred in Boston to secure shorter hours of labor; the trades engaged being carpenters and masons. Strikes have occurred since in various manufacturing towns in Massachusetts about every year; sometimes for shorter hours, sometimes for more pay. In some instances these were accompanied by rioting, and sometimes the militia were ordered out to suppress this. In 1834 several hundred laborers employed in building the Providence railroad, struck for higher wages, and became riotous. This was probably the first railroad strike. As a rule, all the early strikes were unsuccessful, though the continual effort after the "ten-hour" rule for daily labor was eventually successful. In Lowell, Lawrence, Fall River, and other cotton-manufacturing towns in Massachusetts, strikes have been frequent; many of them being accompanied by much bitterness and ill-feeling; and all resulting in serious pecuniary loss to all concerned. In all the large cities strikes have formed a prominent feature of the history of labor. Type-setters, stage drivers, railroad hands, shoe-makers, and nearly all trades and callings have at one time or another in the past half-century experienced these unfortunate aberrations. But the most important event of this nature, was the memorable railroad strike of 1877; when for two weeks, beginning July 14, 100,000 railroad men and 40,000 miners were "on strike" at once; 6,000 m. of railroad, covering several of the trunk lines, were in the hands of an infuriated mob; the state militia and the U. S. army were found necessary to put down the accompanying riotous conduct, murder, and incendiarism; and more than 2,000 freight cars in Pittsburg alone, with their contents, were destroyed, the destruction of railroad property being estimated at \$10,000,000; while in Chicago, Buffalo, Cincinnati, Albany, and other cities, the amount of loss has never been fully estimated. See COMBINATION, *ante*.

STRING-COURSE, a thin projecting course of stone or brickwork in a wall, generally ornamented with a molding, and made to go around windows or other openings in the wall.

STRINGENDO, a term used in music to denote a gradual acceleration in the time.

STRINGHALT is a peculiar catching up of the horse's limbs, usually of one or both hind limbs. It is most noticeable when the animal is first brought out of the stable, when he is excited, or made to turn suddenly round; it is a variety of chorea or St. Vitus's dance. Although a serious eye-sore, it does not interfere with usefulness, and is quite incurable.

STRINGHAM, SILAS HORTON, 1798-1876; b. N. Y.; entered the navy as midshipman, 1809; was in several actions in the *President* and *Spark*, under Decatur and Rodgers; and in 1819-21 as lieutenant in command of the *Cyane* and the *Hornet* conveyed the first settlers to Liberia and captured many slavers. He was promoted to a captaincy in 1841, and participated in the bombardment of Vera Cruz. On the breaking out of the civil war he was made flag-officer of the Atlantic blockading squadron, and the *Minnesota* was his flag-ship. He commanded the naval force which in connection with the land forces of gen. Butler, captured forts Hatteras and Clark. In 1862 he was retired as rear-admiral. In 1871 he became port-admiral of New York, and resided in Brooklyn at the time of his death.

STROBILA. See TAPE WORMS

STROMBIDÆ, a family of gasteropodous mollusks, of the order *pectinibranchiata*, nearly allied to *buccinidæ* (whelks, etc.) and *muricidæ*. The shell has a canal, the external lip of which, as it attains maturity, becomes more or less dilated, and is marked with a sinus, whence the head issues when the animal comes out. The foot is narrow and small, but is employed in active leaping movements, during which the shell oscillates from side to side. The species are numerous, and are mostly inhabitants of tropical seas. Some of them are among the largest of mollusks. *Strombus gigas* is the largest known univalve. It is found in the West Indies, on reefs in shallow water, and is fished both for the table and on account of the shell. Great numbers of the shells are imported into Britain; 300,000 have been brought to Liverpool in a year. They are sometimes called fountain-shell, from their occasional use as a garden ornament. Their chief use, however, is by cameo-makers, by whom they are valued for their solid and delicately tinted substance. A shell sometimes weighs four or five pounds. Pearls of a delicate pink color are sometimes found in this shell. The *strombi* are sometimes called wing-shells, from the dilated margin of the lip.

STROMBOLI, one of the group of the Lipari islands (q.v.), the most north-easterly of the group, is about 12 m. in circumference, circular in shape, and contains 2,000 inhabitants. It is wholly of volcanic formation, and rises to the height of 3,100 ft. above sea-level. On its western side is a volcano of considerable activity. Sulphur and pumice-stone are gathered in large quantities, and among the chief agricultural products are cotton, wine, and excellent fruits.

STROM NISS. See ORKNEY ISLANDS.

STRONG, GEORGE C., 1832-63; b. Vt.; graduated at West Point, 1857, and held the position of 1st capt. of cadets there for 3 years. In 1861 he was attached to the staff of gen. McDowell and acted as his *aide* at the battle of Bull Run. He afterward served with McClellan and Butler, and distinguished himself at Biloxi, Tangipahoa river, and in the assault on fort Wagner, where he was fatally wounded. He rose to the rank of capt. of ordnance and brig. gen. of vols. Gen. Strong was the author of *Cadet Life at West Point*.

STRONG, GEORGE TEMPLETON, 1820-75; b. New York; educated at Columbia college, and called to the bar. He was prominent in his profession, especially in the department of real-property law. He was one of the founders of the Columbia school of mines, a trustee of Columbia college, a vestryman and the controller of Trinity church, New York, and treasurer of the U. S. sanitary commission during the war of the rebellion.

STRONG, JAMES, S.T.D., b. New York, 1822; graduated at Wesleyan university, Middletown, Conn., 1844; settled at Flushing, L. I., and taught Hebrew and Greek to private pupils; received, though a layman, the degree of S.T.D. from Wesleyan university, 1856; professor of biblical literature and acting president of Troy university, 1858-61; professor of exegetical theology in Drew theological seminary, Madison, N. J., 1865; traveled in the east, 1874. In 1853 he became associated with the rev. Dr. John McClintock in the preparation of the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, he having the department of biblical literature. Since the death of Dr. McClintock he has been the chief editor. He has published also *Harmony and Exposition of the Gospels*; *Greek Harmony of the Gospels*; *Manuals of Greek and Hebrew Grammar*; *Outlines of Theology*; *Appeal to Sunday-school Efforts*; also, articles in the *Methodist Quarterly Review* and *Christian Advocate and Journal*. He prepared the translation of the Book of Daniel for Lange's commentary, and is a member of the Anglo-American committee on the revision of the Bible.

STRONG, JAMES H., b. Canandaigua, N. Y., 1814; son of judge Elisha B.; entered the navy as midshipman, 1829; served in the Mexican war; commander, 1861; capt., 1865. He commanded the steamer *Mohawk*, 1861; the *Pttag*, 1862; and the steam sloop *Monongahela*, 1863-65. In 1863 he transported a division of the secret expedition of gen. Banks's army to Brazos, and aided the troops in taking the battery at Arkansas pass. He was in command of the *Monongahela* during her engagement with the ram *Tennessee* in the battle of Mobile bay; commodore, 1871.

STRONG, NATHAN, D.D., 1748-1816; b. Conn.; graduated at Yale college, 1769; tutor there, 1772; ordained pastor of First church (Congregational), Hartford, 1774, where he remained till his death; was a chaplain in the army in the revolutionary war. He published *The Doctrine of Eternal Misery Consistent with the Infinite Benevolence of God*; *Sermons*, 2 vols.; *The Hartford Selection of Hymns*. He originated and edited the *Connecticut Magazine*, and was principal founder of the Connecticut missionary society. He held a high rank for learning and usefulness, and was noted for shrewdness and wit.

STRONG, THEODORE, LL.D., 1790-1869; b. Mass.; graduated at Yale in 1812, taking the mathematical prize; tutor in mathematics at Hamilton college, 1812-16; professor of mathematics at Hamilton, 1816-27. A new geometrical demonstration by him of the values of sines and co-sines of the sum and difference of two arcs, and a solution of a difficult problem in diophantine analysis, were published in the *American Journal of Science* in 1818. Other important papers appeared in subsequent numbers.

After having mastered the *Principia* of Newton and the subjects added by its commentators, he addressed himself to the study of the more modern analysis of La Grange and Laplace. This required a knowledge of the French language which he did not possess, but he soon taught himself sufficient to be able to read mathematical works in French as well as in English or Latin. In 1827, upon a second invitation from Rutgers college, N. J., he became professor of mathematics and natural philosophy in that institution, and removed to New Brunswick, where he remained during the rest of his life, performing the duties of his chair till 1862. Prof. Strong made many important contributions to mathematical science, among which may be mentioned the solution of what is known as the irreducible case of cubic equations of Cardan, a result which had long been sought in vain. He also devised a method for the application of the binomial theorem for the extraction of the roots of whole numbers. His two principal systematic works are: *A Treatise on Elementary and Higher Algebra* (1859); and *A Treatise on the Differential and Integral Calculus* (1869). Both of these treatises contain much original work. In the Algebra, besides what is mentioned above, there is: 1. A direct investigation of the binomial theorem; 2. A simple method of finding integral algebraic roots; 3. A method of solving quadratic equations without completing the square. 4. The doctrine of continued fractions deduced immediately from the form of the quotients and remainders in common division. 5. A new demonstration of the method used for finding the limits of the real roots of equations, including the theorem of Descartes. 6. A new and much more simple method than that of Sturm for finding the first figures of the real roots of an equation. The work on Calculus, written in his 78th year, and without the aid of notes or books, has many original features, and is divested of technicalities and formulas which have become the accretions of time. It contains a solution, by a new and beautiful method, of the problem, "To find the area bounded by the ordinate of a plane curve drawn through the origin of the co-ordinates by any other ordinate and the intercepted parts of the axis and the curve, supposing the ordinates to be constantly positive between the preceding limits." Prof. Strong was a contributor to various mathematical and scientific journals for the greater part of his life. To the *American Journal of Science* he contributed 22 papers between 1818 and 1845. To the *Mathematical Diary*, published at New York and edited at first by Dr. Robert Adrian and afterward by James Ryan, he also contributed. To the *Mathematical Miscellany*, edited by Mr. Charles Gill at Flushing, L. I., he contributed 22 papers; to the *Cambridge Miscellany*, edited by profs. Peirce and Lovering, seven papers; and to the *Mathematical Monthly*, edited by I. D. Runkle, two papers. He also communicated five different papers to the National academy of sciences from 1864 to 1867 inclusive. Among the papers contributed to the *American Journal of Science* are a systematic discussion of the laws regulating the action of a central force, the path of the curve produced thereby, and the mutual action of a system of bodies; a discussion of the parallelogram of forces, their composition and resolution, and the statical equilibrium. In volume xvi. of the journal, on p. 286, there is a deduction of the differential equation which constitutes the fundamental formula for expressing the angular velocity of a planet in terms of its radius vector, and thence, the force being given, the law of the curve of revolution, and of all curves produced by a central force, corresponding to the result given by Laplace in the first part of his second book of the *Mécanique Céleste*, and to that of Newton in the 41st proposition, section viii., of the *Principia*. He was one of the original members of the National academy of science, and was also a member of the Connecticut academy of arts and sciences at New Haven, of the American academy of arts and sciences at Boston, and of the American philosophical society at Philadelphia.

STRONG, WILLIAM, LL.D., b. Conn., 1808; graduated at Yale college, 1828. He studied law, and after his admission to the bar, 1832, began practice in Reading, Penn. In 1849 he was elected to congress and served two terms, after which he resumed practice. In 1857 he was elected a judge of the Penn. supreme court, but resigned four years before the full term (15 years) had elapsed. After two years of practice in the higher branches of the profession, he was appointed associate justice of the U. S. supreme court by pres. Grant.

STRONGYLIDÆ, a family of nematode worms, possessing the following common characters: The body is round, and sometimes very much elongated, and almost thread-like. The mouth is round, oval, or triangular, and situated at the extreme anterior end of the body. The tail of the male is commonly furnished with a bursa, usually emitting two spicules. The whole family is parasitic, and contains a number of genera. Some of the strongylidæ are parasitic in man, some in mammals, birds, reptiles, etc.

STRONGYLUS (from the similar Greek word signifying *round*) is the term applied to a genus of the family *strongylidæ* (q.v.) of nematode parasitic worms. The only true strongylus infesting man is the *S. bronchialis* of Cobbold, previously known as *filaria hominis bronchialis*, *humanaria compressa*, etc. The male usually measures rather more than half an inch, while the female is upward of an inch in length. For the general and specific characters of this rare entozoon, the reader is referred to Cobbold's *Entozoa*, p. 357. The worm was originally discovered by Treutter in 1790, who found several

individuals in the bronchial glands of an emaciated subject. In 1845 it was again found by Dr. Fortsitz at Klausenberg in Transylvania, in the lungs of a boy six years old. These are the only two cases recorded by Küchenmeister and Cobbold of its occurring in the human subject; but closely-allied species, *S. paradoxus* and *S. micurus*, are occasionally found, according to Cobbold, in the lungs and air-passages of the pig and the calf respectively, and Küchenmeister states that he has found a species in the lungs of the sheep.

Closely allied to strongylus is the genus *eustrongylus* of Diesing and Cobbold, which contains the species *E. gigas*, more commonly known as the *strongylus gigas* of Rudolphe, Cuvier, and others. This is the largest nematode worm at present known to infest man or any other animal; "the male measuring from ten inches to a foot in length, and $\frac{1}{4}$ of an inch in breadth; while the female is said to attain a length of over 3 feet, its transverse diameter being fully half an inch; body cylindrical, and more or less tinged with redness; head obtuse, and furnished with a simple oval aperture surrounded by six chitinous nodules: mode of reproduction, probably viviparous; eggs broadly oval, measuring about $\frac{1}{300}$ " from pole to pole."—*Op. cit.*, p. 358. This worm occurs, according to Bremser, in the kidneys and bladder, sometimes in the abdominal cavity and the omentum, more rarely in the lungs and liver of "martens, dogs, wolves, seals, otters, oxen, and horses." Fortunately it is very rare in man, and, according to Cobbold, weasels are the animals in which it is most commonly found. The symptoms to which it must give rise must be much the same as those arising from abscess and degeneration of one of the kidneys, or from renal calculi. The diagnosis in a suspected case could only be established by the detection of the eggs or embryos in the urine.

STRONSAY, one of the Orkney islands, lies 15 m. n.e. from the town of Kirkwall. It is $7\frac{1}{2}$ m. long, and 6 m. in extreme breadth. Pop. '71, 1267.

STRONTIA. See STRONTIUM.

STRONTIUM (symb. Sr, equiv. 43.8—new system, 87.6—sp. gr. 2.54) is a ductile and malleable metal, somewhat harder than lead, and of a pale yellow color. When heated in the air, it burns with a crimson flame, and becomes converted into its oxide, strontia. It is unaffected by the action of dry air, but it decomposes water at an ordinary temperature, hydrogen being explosively developed; and it burns in chlorine gas, and in the vapor of iodine, bromine, and sulphur. It dissolves in dilute nitric acid, but the strong acid has scarcely any effect on it. This metal does not occur in the native state, but exists as a carbonate in the mineral *strontianite* (so called from its being first found near Strontian, in Argyleshire), and as a sulphate in the mineral known as *celestine* (so called from its delicate blue tint). It is obtained by the voltaic decomposition of the chloride of strontium. This metal bears to barium the same close relation that sodium bears to potassium; and the compounds of strontium resemble those of barium not only in their composition but in their properties.

The oxide of strontium, commonly known as **STRONTIA**, is obtained in the same way, and resembles in almost all respects the corresponding oxide of barium, except that it is inert when taken into the system, while baryta is poisonous. When a small quantity of water is poured upon it, it slakes, giving out heat.

The salts of strontia resemble those of baryta in their general characters, and in their being precipitated from their solutions by sulphuric acid and the soluble sulphates; but they differ from them in not being thrown down by silico-fluoric acid or hyposulphite of soda, and in their communicating to the flame of the spirit-lamp and to burning substances generally, a brilliant purple-red color. The salts of strontia occur only in the mineral kingdom, and are never found as normal ingredients of organic bodies. *Carbonate of strontia* (SrO, CO_2) occurs native both in a massive and crystalline form, and may be obtained artificially as a white powder by precipitating a soluble salt of strontium with carbonate of soda. *Sulphate of strontia* occurs native in *celestine*, a mineral which is found in beautiful rhombic prisms in Sicily. *Nitrate of strontia* (SrO, NO_3) separates from a hot concentrated solution in large colorless transparent anhydrous octahedral crystals, which dissolve freely in water. By the addition of nitric acid, it is precipitated from its aqueous solution. This salt is insoluble in alcohol; but when finely powdered, and mixed with it, it communicates to the alcoholic flame a beautiful red or crimson color. In consequence of this property, it is employed by the makers of fireworks. A mixture of 40 parts of nitrate of strontia with 10 of chlorate of potash, 13 of sulphur, and 4 of sulphide of antimony, deflagrates with a magnificent red color, and constitutes what is popularly known as *red Bengal fire*; but the mixture is dangerous both to prepare and to preserve, having more than once been the occasion of frightful accidents to the manufacturers from its becoming ignited spontaneously.

The most important of the haloid salts of strontium is the *chloride* (SrCl), which may be obtained in crystals containing six equivalents of water. The water is expelled at a moderate heat, leaving the chloride anhydrous. The chloride is the only salt from which the metal has hitherto been obtained.

Regarding the history of this metal, it may be observed that strontia was discovered as an independent substance almost simultaneously by Hope and Klaproth in 1793. In 1807 Davy obtained barium and strontium from their oxides, but not in a pure state;

and it was not till 1855 that Bunsen and Matthiessen succeeded in procuring perfectly pure specimens of the metal.

STROPHULUS. See RED GUM.

STROSSMAYER, JOSEPH GEORGE, b. Eszek, 1815. After being educated at Pesth, Vienna, and Padua, he became Roman Catholic bishop of the united sees of Bosnia and Sirmia in 1850. He attended the Vatican council of 1869, and the text of a violent speech, opposed to the introduction of the question of papal infallibility, was published in several journals as having been made by bishop Strossmayer. In 1872, however, he wrote a letter to the *Frangais*, in which he denied having made such a speech. He has been for 30 years a zealous promoter of Slavic interests.

STROTHER, DAVID HUNTER, b. Va., 1816; came to New York in 1845 and studied art for several years. In 1853 he first became known to the public as "Porte Crayon," the author of a series of very amusing papers illustrative of travel, scenery, and manners in the south and elsewhere, some of which were afterward collected in *Virginia Illustrated* (1857). He entered the union army as capt., in 1864, resigned, and in 1867 was brevetted brig. gen. After the war he published in *Harper's Monthly* (where all his writings had appeared) a series of *Personal Reminiscences of the War*. In 1879 he was appointed consul-general to Mexico.

STROUD, a parliamentary borough and market t. of Gloucestershire, 9 m. s.e. of the city of Gloucester, stands in a beautiful and extensive valley, at the confluence of the Frome and Slade, which unite to form the Stroudwater or Frome. It is the center of the woolen manufactures of Gloucestershire, and contains a number of woolen and silk-mills. The water of the Frome is peculiarly adapted for use in dyeing scarlet and other grain colors; and on this account cloth-factories and dyeworks have been built along its banks for the distance of 20 miles. The borough of Stroud forms part of the great west of England cloth districts. Pop. of parliamentary borough, which sends two members to the house of commons, '71, 33,610.

STROUSBERG, BETHEL HENRY (DR.), b. Prussia, 1823; of Jewish parentage; original name Baruch Hirsch Strausbergi; in early life converted to Christianity; entered the office of his uncles, commission merchants, in London, 1835; married an English woman; failed in the insurance business in 1847; became a teacher of languages in New Orleans, 1848; speculated in damaged goods to such advantage that he was able to return to London in 1849, and assist in publishing *The Chess Player* and other magazines. In 1855 he went to Berlin on insurance business, and negotiated for the East Prussian railway. He became a railroad magnate, building railroads in Germany, Hungary, and Rumania, and owning immense factories for manufacturing railroad materials. He established beet-sugar and porcelain factories, and was the proprietor of the Berlin cattle yard, the citadel grounds at Antwerp, and an immense estate in Bohemia. He engaged in vast speculations, employed 100,000 persons at one time, and has been known in Berlin as *Dr Wunderdoctor*. In the war of 1870-71 he met with enormous losses; failed in 1875 in consequence of some transactions with the Rumanian government, and was imprisoned at Moscow in the same year for certain irregularities connected with a bank.

STRUENSEE, JOHANN FRIEDRICH, Count of, a man who, in last century, attracted the attention and excited the sympathy of the whole of Europe, by his elevation and downfall at the Danish court. Struensee was born Aug. 5, 1737, at Halle on the Salle, where his father, Adam Struensee, the author of the old Halle Hymn-book, was pastor of the Ulrichskirche. Young Struensee studied medicine, and when scarcely 19 years old passed as doctor. Early alienated from positive Christianity, he zealously embraced the philosophy which had then arisen in France, and became a disciple of Helvetius and Voltaire. When his father removed to Altona he accompanied him, and was soon afterward appointed traveling physician to the young king, Charles VII. of Denmark; and on their return from a tour, physician in ordinary. At first the young queen, Caroline Matilda, sister of George III. of England, looked upon him with mistrust; and it was not till 1770, when Struensee successfully managed the inoculation of the two-year old crown-prince, afterward king Frederick VI., that she came round to him, intrusted him with the education of the prince, and by degrees made him the confidant of her unhappy position. Struensee removed the estrangement between the royal pair, which was the work of the favorite Holck, and, in consequence, rose still higher in favor with both. He was appointed reader to the king, and private secretary to the queen. Since the revolution of 1660, Denmark had been under the domination of the nobility, who, as a council of state, governed the country. Struensee saw the disadvantages of this government of the nobles, and formed the ambitious resolve to come forward in this land of his adoption as an enlightened reformer after the model of Frederick II. To begin with, he effected the downfall of the favorite Holck, in whose stead his friend Brandt was appointed royal companion and director of the court amusements. In order to gain the love of the people, Struensee proclaimed the freedom of the press. The council was dissolved, and a proclamation issued to the effect that the royal power in all its purity, as it had been handed down from olden times, was to be re-established. These measures amounted in reality to a revolution, and to a declaration of war against the aristocracy. The queen and Struensee, in whose hands the whole power now was, chose new ministers, and excluded

the feeble Christian entirely from the management of affairs. In July, 1771, Struensee received the title of cabinet minister, along with unlimited power. He brought several men from Germany, whom he appointed to different offices. This introduction of strangers caused great dissatisfaction among the people. In opposition to the politics of his predecessors, Struensee endeavored to free Denmark from Russian influence, and to find a natural ally in Sweden. The changes which he undertook in the internal affairs were directed to the advancement of the prosperity of the country, of civil liberty, and enlightenment. He put the finances in order, reduced the expenditure, loosened the fetters in which industry and trade had been bound, encouraged education, mitigated the penal laws, and brought order into the administration. An act passed in 1771 to a certain extent abolished serfage. All these reforms, which are in operation in the Danish dominions at the present day, were excellent; but the haste and want of statesmanlike skill with which they were carried out made them appear as the acts of the most vexatious tyranny. Struensee committed a great mistake, too, in recklessly obtruding his philosophy of enlightenment in the face of the strict orthodox clergy and the pious prejudices of the people.

Struensee had scarcely been in power a year when the symptoms of reaction appeared in all quarters. The queen gave birth to a daughter in 1771, which, in the condition of the king, gave rise to most scandalous reports. The British ambassador, Lord Keith, who saw the catastrophe approaching, proposed to Struensee, by the advice of George III., to take refuge in England; but Struensee declined doing so. At the head of the hostile party was Christian VII.'s step-mother, Juliana Maria, princess of Braunschweig-Wolfenbüttel, who was impatient of the domination of the queen and Struensee. A bold stroke was to precipitate Struensee and ruin the queen, and the night when a court ball was to take place was fixed upon for carrying out the plot. The conspirators assembled at the king's stepmother's, and by a secret door entered the bedroom of the king, and obliged him to make out 15 warrants of arrest, among others for Struensee. Christian was prevailed upon, but with much difficulty, to write out orders to arrest and convey his consort the queen to Kronenburg. Struensee and the queen were then taken prisoners, and the former was treated with extreme harshness, put in chains, and brought to the citadel. He was accused of an assault on the person of the king; of the intention to compel Christian to abdicate the throne; of criminal intercourse with the queen; of using a fatal system in the education of the crown-prince; and of the usurpation and abuse of supreme power. Not one of these points could be legally proved. In a second examination, however, Struensee, with tears, confessed to having had improper intercourse with the queen; but some of his contemporaries affirm that he made the confession under threat of torture. On this important confession, a second commission was sent to the queen at Kronenburg, from whom, however, not the slightest confession of guilt could be extorted. When one of the commissioners at last remarked that if she made Struensee guilty of falsehood he would be put to a disgraceful death for slandering majesty, the queen seized a pen, and began to sign a paper which contained the confession of her guilt. She had not finished when she sunk in a swoon in her chair; and it is said that some one put the pen in her hand, and guiding it, finished the name, "Caroline Matilda." Struensee was found guilty of a great and capital crime, and was sentenced to a cruel death. It was wished by some to proceed further against the queen; but the commissioners were satisfied with the simple separation of the royal pair, especially as the British ambassador threatened the appearance of a British fleet. After the king had confirmed the sentence, not without being urged by the Russian ambassador, it was carried into execution, April 28, 1772, amid the rejoicings of the multitude. In the prospect of death, Struensee is said to have returned to the Christian faith. There is no doubt that he did not deserve his fate, but that he fell a sacrifice to the party of the nobles. The execution of his friend Brandt, which took place at the same time, was a still clearer case of legal murder, as he never took any part in the affairs of government. Struensee's brother would have shared the same fate had not Frederick II. claimed him in a menacing manner as a Prussian subject. Queen Caroline Matilda left Denmark in May, 1772, and died of grief in 1775, in the castle of Celle in Hanover.

In recent times Struensee's history has been recalled to memory in a tragedy by Mich. Beer and Heinr. Laube. See HÖST, *Count Struensee and his Ministry* (1824; Germ. Copenhagen, 1826); Falkenköld, *Mémoires* (Paris, 1826).

STRUTHIONIDÆ. See OSTRICH, *ante*.

STRUTS, straining pieces of timber in a roof, used to strengthen the principal trusses (q.v.).

STRUTT, JOSEPH, 1742-1802; b. England; studied painting, but afterward devoted himself to antiquarian researches. Among his works are *The Regal and Ecclesiastical Antiquities of England* (1773); *The Chronicle of England* (1777-78); *Complete View of the Dress and Habits of the People of England from the Establishment of the Saxons in Britain to the Present Time* (1796-99); and *The Sports and Pastimes of the People of England* (1830).

STRUVE, FRIEDRICH-GEORG-WILHELM, a celebrated astronomer, was b. at Altona, April 15, 1793, educated at the university of Dorpat (Russia), and appointed to a post in the observatory of that place in 1813. He became director of the Dorpat

observatory in 1817, and continued with the utmost assiduity his observations and researches respecting double and multiple stars, adding immensely to our knowledge of these systems; and earning for himself the reputation of being one of the most skillful of practical astronomers. The instrument with which he observed was a Fraunhofer's (q.v.) refractor, of 10 in. aperture, and $13\frac{1}{2}$ ft. focal length; and with this telescope, in gleaning from the depths of space the materials for his three important works on double stars (1822 and 1828, 1837 and 1840, 1852), he examined no fewer than 120,000 of these twinkling luminaries. His investigations have led him to the conclusion, that the number of true double stars is much larger than was previously supposed (see STARS). Struve also executed a number of important geodetic operations, such as the triangulation of Livonia, in 1816-19, and the measurement of an arc of the meridian in the Baltic Provinces, in 1822-27; which was subsequently (1828-56) extended by him in conjunction with Hansteen (q.v.) and Selander, to the North Cape; and by gen. Tenner southward to Ismail in Turkey. This latter undertaking, the most extensive trigonometrical operation ever performed, when completed, gave the length of a meridian arc of 20° , and enabled geometers to determine with increased accuracy the exact form of the earth. Meanwhile, Struve had been appointed, in 1839, director of the best organized observatory in the world, that of Pulkova (q.v.), and also chosen *correspondant* in the astronomical section of the academy of sciences of Paris. He died at St. Petersburg Nov. 23, 1864.—His son, OTTO-WILHELM STRUVE, also an eminent astronomer, was born at Dorpat, May 7, 1819, was educated under his father's direction, became his chief assistant at Pulkova, and the director of the observatory after his death. He has made numerous astronomical discoveries, among which are more than 500 new double stars, and (1847) a satellite of Uranus, and has written numerous important papers, the most noticeable of which set forth his researches on the inner or dusky ring, and on the variation in breadth of the bright rings of Saturn, and on the periodic motions of double stars.

STRYCHNIA, or STRYCHNINE. See NUX VOMICA.

STRYCHNOS, a genus of trees of the natural order *loganiaceæ*, having a five-lobed calyx, a tubular funnel-shaped or salver-shaped corolla, with a five-partite limb, five stamens, a filiform style, numerous ovules, and a one-celled berry, with a leathery rind, many-seeded, or, by abortion, one-seeded, the seeds discoidal and compressed. To this genus belongs the *S. nux vomica*, a tree of middling size, with ovate-stalked leaves, a native of India, the fruit of which is produced in great abundance, and is about the size of a small orange; the seeds are the *nux vomica* of commerce, and yield *strychnine*. The bark partakes of the poisonous quality of the seeds. The wood of the tree is very hard and durable. The clearing-nut (q.v.), and St. Ignatius' (q.v.) bean are produced by species of this genus, to which also belongs the tree (*S. torifera*) which produces the woorai or curare (q.v.) poison of South America. Another species is the URAS TIETÉ (*S. Tienté*) of Java, a large climbing shrub, the bark of which is extremely poisonous, containing a very large quantity of strychnine. The wood of a species found in the north of India (*S. colubrina*), which is also a climber, is an imaginary cure for snake-bites. The bark of *S. pseudo-quina*, a Brazilian species, is used as a substitute for cinchona.

STRYPE, Rev. JOHN, a voluminous ecclesiastical historian, was b. in London in 1643. He studied at Cambridge, entered the church, and held for many years, with other smaller livings, the rectory of Low Leyton, in Essex. He died at Hackney in 1737, having reached the great age of 94. His works fill thirteen large folio volumes. The most important are—*Memorials of Archbishop Cranmer* (1694); *Life of Sir Thomas Smith, secretary of state to Edward VI. and Elizabeth* (1698); *Lives of Bishop Aymer* (1701), *Sir John Cheke* (1705), *Archbishop Grindal* (1710), *Archbishop Parker* (1711), and *Archbishop Whitgift* (1718); *Annals of the Reformation* (vol. i. 1709, vol. ii. 1723, vol. iii. 1728, and vol. iv. 1731); *Ecclesiastical Memorials*, relating to religion and the church of England under Henry VIII., Edward VI., and queen Mary, in 3 vols. folio, published in 1721. This is his best work, forming, with Burnet's more readable *History of the Reformation*, a consecutive and full account of the reformed Anglican church. Strype also published an enlarged edition of Stow's *Survey of London*, with several sermons and pamphlets. As a writer, he is heavy, but honest and plodding, and he was a faithful transcriber of the ancient papers he published, which, he says, were all copied with his own hand.

STUART, Lady ARABELLA, or ARBELLA, 1575-1615, b. England, daughter of Charles Stuart, earl of Lennox, and cousin of James I. Her relationship to Elizabeth gave rise to a number of plots to put her on the throne. Several schemes to marry her were defeated by Elizabeth. In 1603 sir Walter Raleigh was charged with a plot to place her on the throne. In 1610 it was discovered that she had made a secret marriage with William Seymour, grandson of the earl of Hertford. Seymour was imprisoned in the Tower, and she was put in the custody of the bishop of Durham, but escaped to a French vessel, in which her husband, who had escaped from the Tower, was also to sail. He did not reach it, and it sailed and was captured. He escaped, however, in another vessel. Arabella spent the rest of her life in the Tower, and finally became insane.

STUART, CHARLES EDWARD LEWIS CASIMIR, often called the younger pretender, the eldest son of James Francis Edward, prince of Wales, known as the elder pretender, or chevalier St. George (see **STEWART, FAMILY OF**), and his wife Clementina Sobieski, granddaughter of the celebrated Polish monarch, John Sobieski. He was born at Rome, on Dec. 31, 1720, and bore among the Jacobites the title of prince of Wales. He served under don Carlos in Spain, and in his youth is described as having been handsome, affable, and engaging in manners. In 1743 28 years after his father's unsuccessful attempt to regain the crown, a scheme was contrived in France, with the support of the Jacobites in England, by which Charles Edward was to recover the throne of Great Britain for his family. The first contrived project was to land an army in Kent, where were many adherents of the exiled house; and troops to the number of 15,000 were assembled, and transports provided at Boulogne, Dunkirk, and Calais to carry them to England. But the squadron which was to have convoyed the transports fled before the British fleet under sir John Norris; a storm destroyed the transports, and most of the troops were drowned. Charles, however, only awaited a favorable opportunity to make a fresh attempt. In July, 1745, when George II. was in Hanover, and Scotland almost without military, he sailed from Nantes, in company with the marquis of Tullibardine, and a few other devoted followers, and landed in the bay of Lochnanuagh, whence he proceeded to Killochmoidart, where the Highland clans attached to his cause were summoned to rise. Ten days later, Charles's standard was set up at Gleninnan; and he marched southward at the head of a large body of hardy mountaineers. Government offered a reward of £30,000 for the apprehension of the pretender's son, who retaliated by offering a like reward for the apprehension of the elector of Hanover. At Perth, the insurgents were joined by the duke of Perth and lord Strathallan, with a numerous retinue of followers; and on their approach, Edinburgh surrendered without resistance, the castle, which was in possession of the king's troops, still holding out. Charles took up his residence at Holyrood palace, where he proclaimed his father king of Great Britain, and himself regent.

Meanwhile, sir John Cope, the commander-in-chief of the king's troops in Scotland, having collected some re-enforcements in the n., came from Aberdeen to Dunbar by sea, and encamped at Prestonpans. He was there unexpectedly attacked by the Highlanders, and ignominiously routed, leaving baggage, cannon, and camp equipage on the field. Contrary to the advice of his council, Charles, who could not bear opposition, resolved to advance into England, though his force hardly exceeded 6,500 men. Carlisle surrendered at his approach, and he proceeded unmolested as far as Derby. In the mean time, three English armies, each larger than his own, were preparing to meet him. Being unable to raise any recruits in England, he found it necessary to retreat into Scotland, where he hoped to meet a re-enforcement under lord John Drummond. On their way n., the Highlanders were pursued by the duke of Cumberland, whom they defeated near Penrith. Finding that Edinburgh was now in possession of the king's troops, Charles, joined by lord John Drummond and lord Strathallan, made his way to Stirling. That town surrendered to him, and he laid siege to the castle. Gen. Hawley, in endeavoring to raise the siege, was utterly routed by lord George Murray, at the head of the Macdonalds of Keppoch. But the advance of the duke of Cumberland obliged the rebels to retreat further n., and for a time they carried on a desultory war with the king's troops in the neighborhood of Inverness. On April 16, 1746, the duke of Cumberland encountered Charles's army on Culloden moor, and opened a heavy cannonade on them. The Highlanders at first rushed boldly forward; but on the advance of the royal infantry, they gave way; the battle soon became a rout, and the fugitives were pursued and slaughtered by the dragoons, who gave no quarter, and spread carnage and desolation over the country. The rebels lost that day at least 1000 men of the bravest and most devoted to the cause. Charles escaped to the Hebrides, hunted by the king's troops; disguised in female attire, he was conveyed to Skye in an open boat by Flora Macdonald, daughter of Macdonald of Milton. For months he wandered in concealment among the mountains of Skye and the mainland, where he had many hairbreadth escapes; and though his secret was known to hundreds of the poorest of the people, no one was tempted by the £30,000 reward to betray him. He eventually escaped to France, and no further attempts were made to reinstate the exiled family.

Charles Edward remained in France till the peace of Aix-la-Chapelle (1748). It was made a condition of that treaty that France should abandon the cause of the Stuarts; and Charles, refusing to quit France voluntarily, was conducted with a guard out of the kingdom, and retired to Rome.

He married on April 17, 1772, Louisa Maximiliana de Stolberg-Guedern, daughter of Gustavus Adolphus, prince of Stolberg Guedern. The union did not prove a happy one, and the princess withdrew herself from him. See **ALBANY, COUNTESS OF**. In the latter years of his life, the prince was addicted to intoxication. When his claims ceased to be supported by any foreign power, he dropped the title of prince of Wales, and assumed that of count of Albany. He died at Rome, Jan. 31, 1788, and was buried at Frascati. There was no issue of his marriage, but he left a natural daughter, on whom he bestowed the title of duchess of Albany, and to whom he bequeathed considerable property.

Two brothers, generally known as John Sobieski Stuart and Charles Edward Stuart,

endeavored, some years ago, to persuade the world that they were legitimate grandsons of Charles Edward. In point of fact, they were sons of captain Thomas Allen, R.N., and grandsons of admiral John Carter Allen, who died in 1800. Their story, as set forth, with some slight mystifications, in a work called *Tales of the Century, or Sketches of the Romance of History between the Years 1746 and 1846*, was to the effect that their father, in place of being admiral Allen's son, was a son of prince Charles and the princess Louisa, whose birth was kept secret, from fear of the Hanoverian family, and who was intrusted to admiral Allen, and passed off by him for his own son. The life of Charles Stuart is detailed in *History of the Rebellion, 1745-46*, by R. Chambers.

STUART, GEORGE HAY, b. Ireland, 1816; educated at Bainbridge, emigrated to the United States, and engaged in business at Philadelphia; is distinguished as an active Christian philanthropist; during the rebellion was president of the U. S. Christian commission, and afterward of the Indian commission; is president of the Philadelphia branch of the evangelical alliance; a vice-president of the American Sunday-school union, Bible and tract societies. For many years he was very prosperous in business, and is now president of a national bank in Philadelphia.

STUART, GILBERT CHARLES, American painter, was b. at Narragansett, Rhode Island, in 1736. In his boyhood, he went to Edinburgh with a Scotch painter named Alexander, with whom he studied his art; but his master dying, he worked his passage home, and began to paint portraits at Newport. In 1778 he made his way to London, where he led for two years a wild Bohemian life; but his talent was recognized by his countryman, Benjamin West, president of the royal academy, who took him into his family, and whose full-length portrait he painted for the national gallery. In 1781 he opened his studio in London, and painted the portraits of his majesty George III., H.R.H. the prince of Wales, the duke of Northumberland, sir Joshua Reynolds, John Kemble, col. Barré, and many other celebrated characters. He also made a professional visit to Dublin, and in Paris painted a portrait of Louis XVI. In 1793 in the fullness of his powers and fame, he returned to America, and painted portraits of Washington, Jefferson, and many of the distinguished men of the period, and commenced a portrait of John Quincy Adams, which at his death was finished by Sully. He died at Boston, July, 1828.

STUART, JAMES E. B., 1832-64; b. Va.; graduated at the U. S. military academy, West Point, 1854. He was engaged on the frontier fighting Indians, under Sumner and Joseph E. Johnston, and became noted for his daring. In 1857 he was severely wounded while fighting a party of Cheyennes. In May, 1861, president Lincoln appointed him a capt. in the U. S. cavalry, but he declined the appointment to accept from the confederates that of col. of a Virginia cavalry regiment. He commanded the confederate cavalry at the battle of first Bull Run; and in September was appointed brig. gen., and given command of all the Virginia cavalry. He made several successful raids on the union positions, and was appointed maj. gen. in the confederate army, and placed in command of a division of cavalry. On Aug. 22, 1862, he made his famous dash at the right flank of gen. Pope's army, at Catlett's station. During a heavy storm he penetrated to Pope's headquarters, where he succeeded in capturing important papers, besides obtaining the private effects and dress uniform of gen. Pope, and of several of his officers. He made important raids after Antietam; in the Chancellorsville campaign; and during Lee's invasion of Pennsylvania; and covered the confederate retreat after the battle of Gettysburg. He was defeated by Sheridan's cavalry in the Wilderness; and on May 12, 1864, was mortally wounded in an engagement with them near Richmond; to which city he was taken, and where he died on the evening of the same day.

STUART, MOSES, American divine and author, was born at Wilton, Conn., Mar. 26, 1780, and educated at Yale, where he remained for some time as a tutor. He began the study of law, but abandoned it for theology; was ordained as pastor of a Congregational church at New Haven in 1806; and in 1809 was appointed professor of sacred literature at the theological school at Andover, a position he filled till 1848. During this period, in addition to his professorial duties, he wrote a *Grammar of the Hebrew Language*, without points; *Letters to the Rev. W. E. Channing; Hebrew Grammar*, with points (based on Gesenius); *Commentaries on the Epistle to the Hebrews*, and the *Epistle to the Romans*; on the books of *Ecclesiastes*, *Proverbs*, *Daniel*, and the *Apocalypse*; *Hebrew Christomathy*; *Essay on the Liquor Traffic*; *Essay on Christian Baptism*; *Hints on the Prophecies*; *Conscience and the Constitution*—manifesting in all acuteness, vigor, and versatility. He died at Andover, Mass., Jan. 4, 1852.

STUART, MOSES (*ante*), has been called the father of biblical science in this country. While his own contributions to it are of great value, he accomplished still more by the impulse which he gave to others. Studying the Hebrew language with enthusiasm, he infused the same spirit into his classes. He quieted apprehensions concerning the "various critical readings" by announcing that almost all related to unimportant matters, and that the rest, while they change the sense of some particular passages and omit phrases and words, disprove no doctrine, take away no precept, and alter no important fact. To him belongs the honor of opening the treasures of German literature to American minds. His great work was to redeem theology from iron handed metaphysics and call it back to the Scriptures.

STUCCO, a composition used for the finer parts of plaster-work, such as cornices, enrichments, etc. Gypsum (q.v.), or plaster of Paris, is used for this purpose. A coarser kind of stucco is also used for making floors, and for plastering the exterior of buildings.

STUFFING, in cookery, means force-meat used for filling the bodies of small animals, such as poultry, or for stuffing openings made for the purpose in large joints. It usually consists of bread-crumbs, savory herbs, and other seasonings, minced very fine, and made into a paste.

STUHLWEISSENBURG (Hung, *Székes Fejérvár*, Slav. *Bielhrad* or *Bialigrad*, Lat. *Alba Regalis* or *Alba Regia*), a royal free town of Hungary, and seat of a bishop, lies in a swampy plain in the neighborhood of the marshes of Sár-Rét, 16 m. n.e. of lake Balaton. The principal buildings are the splendid cathedral of the Virgin Mary, the church of St. John, and the bishop's palace. It has several Catholic schools, a military academy, and a theater. The inhabitants manufacture cotton cloths, flannels, leather, silk, and knives ("Stuhlweissenburg clasp-knives"), and extract soda from the swamps, which are, moreover, rich in fish, crabs, tortoises, and water-fowl. Pop. '70, 22,683. Stuhlweissenburg is built on the site of the Roman *Floriana*, and from 1027 to 1527 was the place where the kings of Hungary were crowned and buried, 14 of whom repose here. In later times it suffered much from the ravages of war, and was for some years in the hands of the Turks.

STŪPA. See **TOPE**.

STURDY, or the **GRD**, affects sheep, and occasionally cattle, and is caused by the presence within the brain of a hydatid, reaching sometimes the size of a hazel-nut, and floating in a watery fluid inclosed in a membranous sac. This hydatid, when given to dogs, is known to produce tape-worms, and conversely itself originates from the ova of the tape-worm ejected on the pastures by dogs, rabbits, or even by sheep themselves. In the state of ova, or in some of its earlier minuter transitional forms, the hydatid embryo is picked up along with the grass, passes into the blood, and is thence laid down in the soft loose textures of the brain. It is most common in low damp pastures, and amongst sheep from six to twenty months old. The animal cannot properly seek its food, loses condition, staggers when moved, turns stupidly round almost in one spot, and usually toward the side on which the hydatid lies. The parasite and its sac may generally be safely removed by placing the sheep, with its feet tied, on a table or bench, searching for the softened portion of the skull, which generally overlies the hydatid, laying back a flap of skin, and introducing the trochar and canula, and when the sac is deep-seated, cautiously withdrawing it with the help of a small syringe. Protected by a leather cap and simple water-dressings, the wound speedily heals.

STURGE, **JOSEPH**, 1793-1859; b. England; began business in 1820 as a corn-factor in Birmingham, where he amassed a large fortune. He belonged to the society of Friends, and was deeply interested in securing the abolition of slavery. He visited the West Indies and the United States for the purpose of studying the slavery question. He wrote *The West Indies* in 1837, and *Visit to the United States* in 1841.

STURGEON, *Acipenser*, a Linnæan genus of cartilaginous fishes, now forming the family *sturioidæ*, and placed by Müller in the order of *ganoids*, distinguished by the ganoid (q.v.) scales or bony shields which form the external covering. The gills are free, as in the osseous fishes. The vertebral column is soft; and there are no evident sutures in the skull. Reproduction is by roe, as in osseous fishes. The form of sturgeons is elongated and angular; the plates are arranged in regular rows; the head is cuirassed; the snout long and conical; the mouth is on the under surface of the head, tubular, protracile, and without teeth. The upper lobe of the tail is much larger than the under. The dorsal and anal fins are opposite to one another, behind the ventrals. The air-bladder is very large, and communicates with the gullet by a large hole. The species of sturgeon are numerous, and inhabit both the sea and fresh water, ascending deep muddy rivers at certain seasons, and temporarily inhabiting lakes. Numerous species are found in the northern parts of the world, although there are none in the Arctic ocean, or the rivers which flow into it, but the s. of Siberia and North America particularly abound in them. They are plentiful in the Caspian and Black seas, and in the rivers connected with them, where the sturgeon fishery is of great importance, supplying the inhabitants of large districts with their chief article of subsistence, and producing great quantities of caviare (q.v.), or preserved sturgeon roe, and of isinglass (see **GELATINE**), for sale. The **COMMON STURGEON** (*A. sturio*) is sometimes caught in the mouths of British rivers, most frequently in salmon-nets; and is a large fish, 6 or 8 ft. in length, with five rows of flattened plates; the muzzle long and pointed. Another species (*A. latirostris*), with broader muzzle, also visits the British coasts, but they are not popularly distinguished. The sturgeon is more abundant on the northern coast of Europe. It is also found in the more southern parts, and was in very high repute for the table among the Greeks and Romans. At their banquets it was introduced with particular ceremonies. In England, when caught in the Thames, within the jurisdiction of the lord mayor of London, it is a *royal* fish, reserved for the sovereign. Its flesh is white, delicate, and firm. It is used both fresh, generally stewed, and pickled or salted.—The

largest species of sturgeon is the BIELAGA, or HUSO (*A. huso*) of the Black and Caspian seas, and their rivers. It attains the length of 20 or 25 ft., and has been known to weigh nearly 3,000 lbs. It enters the rivers in winter, while they are still covered with ice. Great part of the caviare of commerce is made from it, and much isinglass, which is merely the air-bladder washed, cut into strips and dried. The STERLET (*A. ruthenus*) is a comparatively small species, only about 3 ft. in length, found in the same regions, and particularly esteemed for the delicacy of its flesh, and of the caviare obtained from it. There are several other European and Asiatic species; and some of the North American rivers and lakes abound at certain seasons in species of sturgeon which are peculiar to them.—Sturgeons spawn in fresh water, but the young are seldom seen there, and are supposed to descend very early to the sea.

STURGES, JONATHAN, 1802-74; b. Conn., 1821; became a clerk in a New York mercantile firm, of which he became the senior partner in 1836, and with which he remained until 1863, when he retired with large wealth. He was noted for his support of the course of the government during the war, and for his activity in the cause of reform in city government, as well as for his liberal contributions for benevolent purposes.

STURGIS, SAMUEL DAVIS, b. Penn., 1822; graduate of West Point, 1846; served through the Mexican war; taken prisoner during the operations before Buena Vista; exchanged after a short confinement. He was on duty in California, New Mexico, and the w. frontier; capt., 1855. In the war of the rebellion he was obliged to abandon fort Smith, Arkansas (his officers having resigned to join the confederate army), taking with him his command and saving the government property. As maj. 4th cavalry, 1861, he served under Lyon, and succeeded to his command at Wilson's creek. In 1862 he was assigned to the command of the fortifications at Washington. He was prominent at South mountain, Antietam, Fredericksburg, and in the operations in Kentucky and Ohio, 1863-64, joining in the expedition against gen. Forrest; col. 7th cavalry, 1869; maj.-gen., 1865.

STURT, Sir CHARLES, 1806-69; b. England; entered the British army, and in 1825 was stationed in New South Wales, then holding the rank of capt. In 1828 he headed an exploring expedition which penetrated the interior of Australia and discovered the Macquarie, Castlereagh, and Darling rivers, and in 1830, the Murray river, which he descended to lake Alexandrina. Another expedition in 1844 reached the desert in the center of the continent. For these explorations he was honored with high colonial positions and on his return to England was knighted. He published two books describing his explorations.

STURTEVANT, JULIAN M., D.D., b. Conn. 1805; became professor of mathematics in Illinois college, and in 1844 was elected its president, still retaining the professorship. He published a lecture on *The Present Attitude of England toward the United States*, and has contributed to the *New Englander*, *Biblical Repository*, and other religious periodicals. He is original and vigorous as a thinker.

STUTSMAN, a co. in n. Dakota, drained by the Dakota river and Pine Stem creek; 2,304 sq. m.; pop. '80, 1007—694 of American birth, 3 colored. It is intersected by the Northern Pacific railroad. It contains the fort Seward military reservation. The surface in the vicinity of its co. seat is much diversified, in other portions stretching into level fertile prairies for miles on either side of the railroad track. Co. seat, Jamestown.

STUTTGART, the royal residence and metropolis of Würtemberg, is beautifully situated in a widening of the Nesenbach valley, the hills forming a semicircle of eminences clothed with vineyards, orchards, and gardens. The basin in which Stuttgart nestles is 897 ft. above the sea-level, and enjoys a mild and healthy climate.

Except the very oldest part of the city, the streets are broad, and the buildings handsome. The schloss, or palace, is a fine modern building. The royal park and gardens extend from the n.e. side of the palace for 2 m. in the direction of Canstatt, have an area of 560 acres, are adorned by fine groups of trees, and intersected by shady avenues, in which all classes may freely walk. The cathedral, built in the 15th c., was gifted by the king, in 1852, with several beautiful painted windows. Other principal buildings are the royal theater, public library, mint, museum of art, polytechnic school, erected in 1860-65, the royal stables for 300 horses, etc. A fine statue of Schiller has been erected in the palace place. The royal library contains 300,000 volumes, 3,600 MSS., 9,000 Bibles in 80 languages, and 2,400 specimens of early printing.

Stuttgart has many benevolent institutions and societies. There is direct railway communication with the leading cities of Germany, Switzerland, France, Belgium, and the Netherlands. Pop. in 1871, 91,623; of whom 78,624 were Protestants, 10,708 Roman Catholics, and 1817 Jews; in 1875, 107,273. Since 1866, and especially since the Franco-Prussian war, trade has increased in a remarkable degree. The principal industries are the manufacture of cotton and half-wool fabrics, iron and tin work, gold and silver articles, chemicals, tobacco, beer-brewing, etc. The export of Stuttgart manufactures to North America alone, averaged in late years 4,000,000 to 5,000,000 thalers. Stuttgart has a high position in the book-trade, and is the place of meeting of the booksellers' union of southern Germany. Stuttgart was the birth-place of Hegel;

here, also, Schiller's youth was spent. The name of the city occurs for the first time in 1229. It was besieged by king Rudolph of Hapsburg, 1286-87, and appears then to have been a place of strength. Between 1634-38, nearly 9,000 people died of the plague; and during the wars of Louis XIV., Stuttgart was thrice taken; and again in 1796, 1800, and 1801.

STUYVESANT, PETER, 1602-82, b. Holland; in early manhood entered the military service of the Dutch in the West Indies, and in 1634 was made director of the colony of Curacao. In 1647 the Dutch West India company appointed him director-general of their American colonies. He soon gained the confidence of the colonists, and reconciled the Indian tribes who had been made hostile by former unjust treatment. He also succeeded in arranging with the English commissioners, in 1650, the boundaries between their respective territories. A convention of delegated colonists in 1653 demanded for the people, among other things, a confirming voice in the appointment of local officers. Stuyvesant, with characteristic boldness, ordered them to disperse forthwith, claiming that his authority was not from the people, but from God and the Dutch West India company. The people submitted, but with mingled feelings of chagrin and discontent. The protracted contentions of the Dutch and the Swedes, dwelling near the Delaware river, about governmental jurisdiction, became more critical in 1654 when the Swedish governor seized the fort built by the Dutch, where Newcastle now stands. To end this trouble, Stuyvesant with 600 men sailed up the Delaware, re-captured the fort, and established the Dutch authority over the entire territory. After ten years of undisturbed quiet, in 1664 an English vessel arrived with an armed force under col. Nicholls, who demanded a surrender of the government, on the ground that the whole territory was given by royal charter to the duke of York. Stuyvesant at first refused, but finding the people anxious to exchange rulers, he yielded to the English demand. Thus abruptly terminated the Dutch control over the New Netherlands, and both the town and the territory was thenceforth called New York. Stuyvesant reported personally to the authorities in Holland, but soon returned to New York for the remainder of his life. He cultivated an extensive farm called the Bouwerij, giving its name to one of the busy streets of the city. A pear tree in his garden, which he brought from Holland, bore fruit more than 200 years. As an interesting relic of the past and of the man so highly and so justly honored, the city authorities for many years protected this pear tree by a tall iron railing. Stuyvesant died in 1682, aged 80 years. He was buried where St. Mark's church now stands, and the elaborately inscribed stone that covered his grave is built into the eastern wall of the church.

STYE, or **STY**, is the popular name for a minute boil occurring at the edge of the eyelid, and known to surgeons under the term *hordeolum*. It begins as a small, red, tense swelling, accompanied with considerable itching, and a feeling of stiffness. As the inflammation goes on, the lid may become so swollen as to keep the eye closed. In a few days, matter forms, a white point appears at the apex of the swelling; and when the cuticle gives way, pus and a small slough of connective tissue escape, after which there is a general remission of the symptoms, and the eyelid soon resumes its natural state.

This common affection is chiefly confined to scrofulous and delicate children, but it is sometimes observed in persons of more advanced age. The best local treatment consists in the application of warm-water dressings with lint and oiled silk; and if any hardness remains after the discharge of the matter, dilute nitrate of mercury ointment may be applied. The sty should never be rubbed (notwithstanding the common prejudice in favor of rubbing it with a gold ring), nor, in general, is it necessary to puncture it. To prevent the recurrence of these little boils, attention should be paid to the diet, which should be abundant and nourishing, to the state of the bowels, and to the general health; and tonics may usually be prescribed with advantage. The old form of the word was *stian*. See Holland's *Plinie*, book xxviii. ch. xi.

STYLE, OLD AND NEW. NEW CALENDAR.

STYLITÉS. See **PILLAR SAINTS**.

STYLOBATE, the substructure of a temple beneath the columns. It is sometimes continuous all round the peristyle in the form of three high steps; sometimes it resembles a continuous pedestal along each side, with flights of steps at either end.

STYPTICS (Gr. *styptikos*, astringent) are agents employed in surgery for the purpose of checking the flow of blood by application to the bleeding orifice or surface. See **BLEEDING**.

STYRAX. See **STORAX**, *ante*.

STYRIA (Ger. *Steiermark*), a duchy forming one of the German crown-lands of Austria, is bounded on the n. by upper and lower Austria, e. by Hungary and Croatia, s. and w. by Carniola, Carinthia, and Salzburg. Its area is 8,671 English sq.m., and pop. '70, 1,137,990, who are partly of German and partly of Slavic origin. Styria is a mountainous country, being traversed in the w. and center by branches of the Noric Alps, which spread out into numerous ramifications: while the southern portion between the Drave

and the Save is occupied by branches of the Carnic Alps. The climate of Styria, like that of most mountainous countries, is variable, but is generally raw and cold in the northern and more mountainous portion, and mild in the south. But in spite of its physical character, agriculture is so zealously prosecuted that $\frac{2}{3}$ of the country are under cultivation, producing rye, wheat, oats, and maize. Vines are largely cultivated in various parts, and orchards are numerous. The chief wealth of the country, however, lies in its mineral products, which include, besides immense quantities of iron, lead, copper, gold, silver, marble, limestone, and slate, with abundance of salt and coal. The chief industries are thus necessarily in connection with the production of iron and steel, and their manufacture into articles of such excellent quality as to be in great demand in other countries. There are also manufactures of brass and lead articles, earthenware, paper, tobacco, glass, white-lead, copper hammers, and of cotton, linen, cloth, etc. Styria was anciently divided between Noricum and Pannonia, and has generally followed the fortunes of the two provinces of Upper and Lower Austria.

STYX (Gr. *stug-*, to hate, abhor), a water-fall in Greece, near the town of Nonacris, in the n.e. of Arcadia, descends perpendicularly over lofty and precipitous rocks, and forms a small torrent, which falls into the Crathis. The scenery around it is weird and desolate, so that the Greeks regarded the Styx with superstitious awe; the water being supposed to be poisonous, and to break every vessel into which it was put, except those made of the hoof of a horse or an ass. It was reported that Alexander the great had been poisoned by it. It is now called *ta Mavraneria* (the black waters), and also *ta Drakoveria* (the terrible waters), the belief in its poisonous qualities still surviving.—In mythology the Styx was a river of Hades, round which it flowed seven times, and over which Charon (q.v.) conveyed the shades of the departed. As a goddess Styx was the daughter of Oceanus and Tethys, dwelling in a grotto at the entrance of Hades. She was the confirmer of the most solemn oaths of the gods.

SUABIA. See **SWABIA**.

SÜAKIN, a sea-port belonging to Turkey, on a small rocky island in the Red sea, off the w. coast of Africa, but near the shore, in lat. about $19^{\circ} 10'$ north. It has a good harbor, and a considerable trade, especially in gums; and it is a station for pilgrims passing to and from Africa. Population estimated at 8,000.

SUARES, FRANCISCO, the most celebrated of the modern scholastic and polemical divines of the Roman Catholic church, was born at Granada in 1548. His early studies were singularly unpromising; and it is remarkable, in the history of a man afterward so eminent, that it was not without great difficulty, and after repeated trials, that he obtained admission into the society of the Jesuits. His later career, however, was brilliant, quite in proportion to the dullness of his first beginnings; and he taught philosophy and theology with remarkable success, first at Alcalá, and afterward at Salamanca, Rome, and Coimbra. The accounts given of his habits of application to study are almost beyond belief. He is said to have habitually devoted seventeen hours a day to study. Of his power of memory, the marvels related are scarcely less prodigious. He is said to have been able to repeat at will any portion of the whole 23 folio volumes of his own works, even to the quotations from the fathers and other theological writers with which they abound. Suares may truly be described as the ablest and greatest of the modern scholastics; but in his works scholasticism appears in its best form; for although they abound in discussions uninteresting, and indeed unintelligible, to persons unacquainted with scholastic terminology, yet they may also be truly said on each subject to exhaust the whole of the learning, ancient and modern, which existed relating to that subject at the date of their publication. On the philosophy of the ancients, Suares is especially copious and accurate; and of most of the modern German philosophy we may find the germ in the pages which he devotes to the account of the opinions of the ancients.

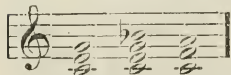
In the scholastic controversies on grace and free will, Suares was strongly opposed to the Thomistic doctrine; but he also rejected the opposite system of Molina. See **MOLINISM**. The scheme of reconciling the freedom of the will with the efficacy of grace, and of saving at the same time, the doctrine of "special election," devised by Suares, is called *congruism*, and is explained under the head **MOLINA**. The works of Suares are entirely theological, or ascetic, and were printed in 23 volumes folio at Lyons, Mainz, and Venice. An edition in 28 volumes 4to was completed at Paris in 1861. His treatise *De Legibus* is much esteemed, and has been reprinted in England. Suares died at Lisbon in 1617.—See Des Champs, *Vie de Suares* (4to, Perpignan, 1671).

SÛ BAH DAR was, under the mogul government, the title of a governor of a province. It now designates a native officer, holding a rank equivalent to that of captain under the European officers.

SUBALTERN, in the army, or rather in a regiment, is a company officer below the rank of captain; i.e., a lieut. or sublieut.

SUBDOMINANT, in music, the fifth below the tonic; the note whose dominant is the tonic. Thus F is the subdominant of C, and C of G. One of the keys most nearly related to any key is its subdominant; and the easiest of all modulations is that from a key to its subdominant, which is effected by adding the dominant seventh to the com-

mon chord, and the resolution of this chord is the common chord of the subdominant; e.g., in modulating from the key of C to the key of its subdominant F, we have



See DOMINANT.

SUBIACO (anc. *Sublaqueum*), a city of the province of Rome, on a hill by the Teverone, 30 m. from Rome. Subiaco possesses a fine cathedral, and many monuments of antiquity. There was a famous Benedictine monastery in Subiaco, and here, in the 15th c., one of the earliest printing-presses in Italy was established. Pop. 7,000.

SUBJECT. See OBJECT.

SUB-KINGDOMS, ANIMAL, a term applied to the great primary divisions of the animal world. The sub-kingdoms are also named "morphological types," and this latter term serves to indicate their constitution more definitely than the name "sub-kingdom." As an example of the manner in which a "sub-kingdom" of animals is constituted, we may select that of the *Annulosa* or *Articulata*, a group of animals which was clearly defined by Cuvier himself, and which has remained since his day, with few alterations, as one of the most distinctive groups of the animal creation. A lobster may be selected as a typical example of this group. In the detailed examination of this animal, we may note that the jointed nature of the tail is perceptible in the fore part of the body, notwithstanding that the latter region consists apparently of a single piece. A further examination of the lobster's body would reveal the fact that each joint and its appendages—the latter being "paired"—agrees in essential or fundamental structure with every other joint of the body. The investigation of the plan of structure of the lobster's frame would show a very typical arrangement of parts. The heart lies dorsally, or on the back. The digestive system occupies a median position; and the nervous system lies ventrally, or on the floor of the body. The nerve-axis of the lobster further consists, typically, of a double chain of nervous masses (or *ganglia*) united by nervous cords, and from which branches proceed to the various parts of the body. The ideas we may gain regarding the general type of structure of the lobster's body, or plan on which that body is built up, may be thus summarized: (1.) The body is jointed; (2) the joints and their appendages are fundamentally similar or homologous; (3) the heart lies dorsally, the nervous system ventrally, while the digestive system occupies the median position; (4) the appendages are in pairs. Now, if we examine the body of any insect, we shall find it to essentially resemble that of the lobster in the general arrangement of its parts. The body of a spider or a scorpion exhibits a similar disposition of organs to that of the lobster, and shows a fundamentally similar structure beneath variations in appearance and form; and a centipede's body would be found to be also constructed on the lobster-type. The barnacles, water-fleas, crabs, and a whole host of animals more or less nearly allied to the lobster, and belonging to the lobster's class (that of the *Crustacea*), exhibit a near relationship with the typical animal; while worms generally (leeches, earth worms, etc.) would present a fundamental similarity in their characters to those described as existing in the lobster. We thus discover uniformity of type beneath variations in form and appearance, and it is exactly this uniformity or broad structural likeness between apparently different animals which enables us to group them together to form "sub-kingdoms" or "types." A sub-kingdom or type of animals may therefore be defined as consisting of a number of animals whose bodies are constructed on the same fundamental plan. Lobsters, crabs, barnacles, etc., insects, spiders, scorpions, centipedes, and worms thus form the "sub-kingdom" *Annulosa*, on account of their agreement in fundamental structure, and in the essential characters just described as being typically exhibited by the lobster. The animal world is thus divided into five or six sub-kingdoms. Between some of these groups recent research—altogether unfavorable to the construction of defined sub-kingdoms or types—has demonstrated connecting links to exist. But by the great majority of zoologists, the following divisions are recognized:

- I. PROTOZOA—Ex.: Sponges, infusoria, amœbæ, and other animalcular forms.
- II. COELENTERATA—Ex.: Sea-anemones, corals, zoophytes, jelly-fishes, etc.
- III. ECHINOZOA—Ex.: Sea-urchins, star fishes, crinoids, sea-cucumbers, tape-worms, flukes, etc.
- IV. ANNULOSA—Ex.: Worms, insects, centipedes, spiders, crustacea.
- V. MOLLUSCA—Ex.: Sea-mats, sea-squirrels, lamp-shells, shell-fish, cuttle-fishes.
- VI. VERTEBRATA—Ex.: Fishes, amphibia, reptiles, birds, mammals.

SUBLAPSA'RIAN (Lat. *sub-lapsus*, after the fall), the name given to one section of the school of divines, who maintain the doctrine of absolute decrees of election and reprobation. It is possible to conceive God making such a decree in two different ways, either on the hypothesis of his foresight of the fall of Adam, and thus of original sin, or independently of such foresight on his part, and without any reference to such foresight, and entirely out of his own free will and determination. The sublapsarian system supposes the former; and thus refers the eternal election or reprobation of men by God to his foreseeing that all men would fall in Adam, and thus would deserve eternal reprobation. Out of the entire mass of mankind thus fallen, he freely pre-lects some

to life, and equally freely predooms others to death. This distinction is not confined to the Calvinistic schools; it is also found among the Roman Catholics. See SUPRALAPSARIAN.

SUB-LIEUTENANT is the junior combatant commissioned officer in the royal navy. When a midshipman has served six years, and can pass in seamanship and certain other subjects, he becomes a sub-lieutenant, and is eligible for promotion to lieutenant on opportunity occurring. The pay of a sub-lieutenant is £91 5s. a year, and the half-pay, £45 12s. 6d. An officer usually serves but a short time in this rank; and, if not promoted earlier, he must retire at 40 years of age. Until within a few years, the sub-lieutenant was called a mate (q.v.). The establishment is in process of reduction to 250 as a fixed number. In the army cornets and ensigns are now sub-lieutenants.

SUBLIMATION is a chemical process similar to distillation, but differing from it in the nature of the substances to which it is applied. While in distillation *liquids* are converted by the agency of heat into vapor, which is condensed in the liquid form usually by the cooling action of water; in sublimation, *solid* bodies are reduced by heat to the state of vapor, which reassumes the solid form on cooling. Sublimation is usually conducted in a single vessel of glass or iron, the product being deposited in the upper part of it in a solid state, while the impure residue remains at the bottom; but in the case of sulphur, the vapor is condensed on the walls of a large chamber. Iodine affords a good example of sublimation. On gently heating the lower part of a Florence flask containing a little of this substance, a purple vapor rises, which almost immediately condenses in small brilliant dark purple crystals in the upper parts of the flask, while any impurity that may be present remains at the bottom. Among the substances obtained by this process, and employed in the pharmacopœia, are arsenious acid, benzoic acid, corrosive sublimate, and sublimed sulphur.

SUBLIME. Objects indicating great power, vast expanse, or lofty elevation, excite in the beholder a feeling of pleasurable elation; and the name "sublime" is applied both to the objects and to the feeling.

The precise quality in things that arouse this mode of pleasurable excitement has been variously assigned. According to Burke, *terror* is, in all cases whatsoever, either more openly or more latently the ruling principle, or, at all events, one of the chief sources of sublimity: Blair suggested that *mighty power or force* is the cause; Payne Knight ascribed it to *mental energy*; Kaimes considers it due to *height or elevation*; Dugald Stewart, in an elaborate essay, affirms that *elevation* is the leading characteristic, and that expanse and power are sublime by suggesting or implying great height; Sir W. Hamilton says that sublimity requires *magnitude* as its condition, and exists in three forms—space, time, and power.

The feeling itself has also been described variously. If this could be fixed, we should have a key to the objective quality. Longinus characterized it, in reference to literary composition, as "filling the reader with a glorying and a sense of inward greatness." Some would call it a "sense of security" in circumstances of terror or danger. Hamilton describes it as "a mingled feeling of pleasure and pain—pleasure in the consciousness of the strong energy, pain in the consciousness that this energy is vain." The connection with the sentiment of power is generally admitted; but as the comparison of the object with self suggests our own littleness at the same time, there may be a doubt as to whether the emotion is due to the power, to the littleness, or to the combination of both.

Referring to the generic sentiment of power, which is evidently at the foundation, we find that the feeling of superior might in ourselves is cheering, elating, stimulating; and that the sense of littleness or inferiority is a depressing and enfeebling state of mind, a state of pure pain, redeemable in certain circumstances by other feelings, as when our inferiority is only in the comparison with an object of love or veneration, or when it is the condition of some compensating superiority—"the courtier stoops to rise." The presumption, therefore, is that the elation of the sublime is connected with the notion of power. It may be felt although the power is not actually possessed, but imagined, borrowed, or conceived, through a sort of sympathy with the *appearances* of great power or might. If this account of the feeling be correct, power must be a principal quality in its objects; and if with this we combine voluminous sensation (and the corresponding ideas, vastness of expanse and greatness of time), we shall probably be able to explain the sublime in all its forms.

SUBMARINE FORESTS occur at several places around the shores of Britain and Ireland. They consist of beds of impure peat, containing the stools of trees which occupy the sites on which they grew; but by change of level, the ancient forest surfaces are now covered by the tide even at low water. No kind of tree has been found in these forests which does not exist at the present day in the country, and the underwood and herbaceous plants, so far as determined, agree specifically with those found now in similar localities. Submarine forests belong to the recent or quaternary period, and occur above the boulder clay.

SUBMARINE NAVIGATION. When the diving-bell (q.v.) had shown that air for respiration can be supplied to persons placed in adequately arranged vessels under

water, ingenious men began to speculate on the possibility of navigating closed ships or boats in similarly exceptional circumstances. Cornelius Drebbel made a vessel to be rowed under water in the time of James I. In 1774 an inventor named Day lost his life during an experimental descent in Plymouth sound, in a vessel of about 50 tons burden. Mr. Bushnell, of Connecticut, in 1775, and Robert Fulton, about 1796, contrived submarine vessels, intended to be used in warfare. The vessel patented in 1859 by Mr. Delaney, of Chicago, was egg-shaped in transverse section, and diminished nearly to a point at each end. It had two iron tanks in the interior; one had air forced into it by an air-pump; the second contained water. The engineer of the boat, by pumping water into or out of the second tank, through the action of the air in the first, could raise or lower the boat to different depths in the water.

SUBMAXILLARY GANGLION, one of the four sympathetic ganglia lying in the cephalic region, sometimes called cranial ganglia; but the latter term is rather misleading, as none of the ganglia are within the cranial cavity. The submaxillary ganglion is situated above the deep portion of the submaxillary gland. See **SALIVARY GLANDS**, *ante*. It is connected by filaments with the lower border of the gustatory nerve (nerve of taste, supplying the tongue). It also receives motor filaments from the chorda tympani nerve, a branch of the facial. It is small, rounded, and of a reddish-gray color; its filaments of distribution, five or six in number, arise from the lower part of the ganglion, and supply the mucous membrane of the mouth and Wharton's duct, some being lost in the submaxillary gland.

SUBORDINARY, or **SUBORDINATE ORDINARY**, in heraldry, a name given to a certain class of charges mostly formed of straight or curved lines. Heraldry vary a little in their enumeration, but the following are generally held to come within this category: the bordure, the orle, the tressure, the flanche, the pile, the pall, the quarter, the canton, the gyron, the fret, the inescutcheon, the lozenge, the fusil, and the mascle. See these heads; also **ORDINARIES**.

SUBORNATION OF PERJURY is the offense of procuring another to take such a false oath as constitutes perjury (q.v.) in that other. It is a misdemeanor, punishable anciently by death; afterward banishment, or cutting out of the tongue; then forfeiture of goods; and latterly, as at present, by fine and imprisonment.

SUBPENA, in English law practice, means the writ or process by which the attendance of a witness in a court of justice is compelled. It is a writ in the queen's name, commanding him to lay aside his business and all excuses, and attend at the time and place indicated, under a penalty of £100. If the witness is required to produce a document, the writ is called a *subpena duces tecum*. If the witness do not attend, and has not a good legal excuse, such as dangerous illness, he may be sued in an action of damages or committed to prison.

SUBROGATION, in law, the substitution of another person in the place of the original creditor. The person thus taking the creditor's place succeeds to all the rights of the latter. Subrogation is taken from the Roman law, and belongs to equity rather than to common law jurisprudence. It may be conventional, where it takes place from the agreement of the parties; or may result from the action of the law, as where it takes place for the benefit of co-promisors and for the benefit of sureties against their principals. When a second mortgagee pays the first mortgagee's claim, he at once becomes the equitable assignee of the first and can compel actual assignment, and so in all cases where a prior creditor is paid by a subsequent one. If an entire debt be paid by one of several joint debtors, he is entitled to contribution from the others and subrogation takes place.

SUB ROSA, "under the rose"—i.e., between ourselves, or in secrecy. It was customary among the ancient Germans, on occasions of festivity, to suspend a rose from the ceiling above the table, as a symbol that whatever was said during the feast by those present would be afterward forgotten, or at least be kept as a secret among themselves.

SUBSCRIPTION, in law, a written contract by which a person agrees to contribute a sum of money for a specified purpose; as a subscription for a college or a newspaper. If the contract be legal and grounded on good consideration a subscriber may be sued for his subscription as soon as the condition upon which he made the promise is fulfilled. It has even been held that subscribers for a common purpose may be regarded as contractors with each other, and the consideration of each subscription the promises of all the other subscribers, so that each subscriber may be sued by all the others. This seems to be scarcely tenable, and it is customary to make subscriptions payable to a treasurer. Wherever action has been taken upon the subscription by the expenditure of moneys or otherwise, before notice received of the withdrawal of a subscription, there is a consideration sufficient to support the promise, which may then be enforced.

SUBSIDIES, a term in politics, used in two different senses: 1. It is applied in English political history to taxes levied not immediately on property, but on persons, in respect of their reputed estates in lands or goods; or customs imposed on any of the staple commodities in addition to the *costuma magna et antiqua*. Thus 30,000 sacks of wool were granted to Edward III. in 1340, in aid of the war with France. Subsidies were granted on various occasions to James I. and Charles II. 2. The same word is

used to denote money paid by one state to another, in order to procure a limited succor of auxiliary troops, ships of war, or provisions. In the time of the war with the revolutionists of France and Napoleon I., Great Britain furnished subsidies to foreign powers to a large extent, in order to engage them to resist the progress of the French. In questions regarding subsidies, it is held that the state furnishing the succor does not thereby become the enemy of the opposite belligerent; it may remain neutral in all respects, except as regards the auxiliary forces supplied. Such, for example, was long the attitude maintained by the confederate cantons of Switzerland: while granting troops to the various European powers, they were in the habit, at the same time, of preserving a rigorous neutrality. The service of Swiss regiments abroad is no longer sanctioned. The federal constitution of Switzerland, of Sept. 12, 1848, prohibited the conclusion of military capitulations; and on July 30, 1859, a proclamation was issued by the federal council, forbidding any Swiss subjects from taking service under a foreign power, without the authorization of the council.

SUBSTANCE, a word connected with certain discussions in logic and metaphysics. Substance is correlative with quality or attribute. Every substance must have attributes, and every attribute must be the attribute of some substance. The substance gold has the attributes weight, color, etc. But as every power or property of a thing, every way that the thing affects us, may be called an attribute or quality, if all the attributes are counted off, there is nothing left; and the question then arises: What is the *substance*? To avoid this seeming inconsistency, it was assumed that everything whatsoever possesses, besides its attributes, an unknown substratum that they rest upon, or inhere in—a mystical and inscrutable bond, that holds the attributes together, without being itself an attribute. This gratuitous assumption of what is, after all, a nonentity, was repudiated by Locke and others, who found a meaning for substance without departing from the knowable. Every object has some *essential* or *fundamental* quality, which being present, it preserves its identity; and which being removed, it is no longer the same object, but another. Thus the substance of body or matter is not the remnant after all the qualities are subtracted; it is the two fundamental and ineradicable qualities, extension and resistance; size, shape, color, heat, odor, etc., may all be varied; but so long as extension and resistance in any degree are found, we have a piece of matter. On the same view, the substance of mind is whatever we regard as its fundamental essence, or distinguishing marks. We may adopt feeling, or volition, or intellect, or require a share of all three, according to our mode of defining the mind. It would, then, be a mere confusion of language to talk of feeling, volition, and intellect as *inhering* in mind; they *are* mind, and there is nothing besides.

Notwithstanding the obviousness of this explanation, the employment of the words substance and attribute has led to such an inveterate demand for something that shall underlie all attributes—a substance of body, and a substance of mind—distinct from anything meant by the names, that many philosophers have considered it necessary to preserve the phantom as a thing of belief, if not of knowledge. The doctrine of an unknowable substance in the abstract very early allied itself with the popular theory of the perception of a material world (see PERCEPTION), and the same arguments are good, for or against both. Other names for expressing the same contrast are *noumenon* and *phenomenon*. The phenomenon is what shows itself to our senses, or is conceived by our intelligence—the qualities of extension and resistance in body; and of feeling, etc., in mind. The noumenon is something apart and beyond, something inconceivable and unknowable, but which, say some, we are instinctively led to believe in. Thus, in the great question above alluded to—the belief of an independent material world—the phenomenal manifestations are inextricably involved with our mental powers of conceiving, and would vary, if these were to vary; consequently, they cannot be the absolute, independent, self-existent reality; which drives one school of philosophy upon the expedient of believing in such a reality, although it must be for ever incomprehensible to us.

SUBSTITUTE, MILITARY. In nations where conscription is resorted to for the supply of soldiers for the army, the lot often falls on those unwilling to serve in person. In such a case the state sometimes agrees to accept the services of a substitute who is of equally good physique. Unless the levy be very extensive, or the term of military service very long, substitutes are readily found among military men who have already served their prescribed period. Of course, the substitute must be paid for the risk he runs. His price depends, like all other saleable articles, on the demand and supply. Happily, in Great Britain, few of those now living have ever known when substitutes were necessary. It is, however, to be remembered that the act for a militia ballot hangs continually over us, and is only suspended by a special act of parliament from year to year.

SUBSTITUTION is one of the three principal methods employed in examining the chemical composition of organic bodies, and in tracing their relation to other compounds; the two other methods being those of *oxidation* and of *reduction*. Although the term is restricted to organic chemistry, the ordinary method of preparing insoluble inorganic compounds by double decomposition is in reality a case of substitution of one base or one acid for another. If, for instance, solutions of nitrate of lime and sulphate

of soda are mixed together, the resulting compounds are sulphate of lime and nitrate of soda, in which the lime is substituted for the soda, and the soda for the lime. In some cases an element may be replaced (or, more correctly, displaced) by a compound group; thus, cyanogen, C_2N , may take the place of oxygen, as, for example, in the reaction that ensues between hydrocyanic acid and red oxide of mercury, when cyanide of mercury and water are formed, as shown in the equation $H(C_2N) + HgO = Hg(C_2N) + HO$. Similarly, the groups NO_3 , SO_2 , and NH_2 may often be substituted for hydrogen. In various organic bodies, one or more atoms of hydrogen may be displaced by one or more atoms of chlorine, a fact which was originally observed by Gay-Lussac in noticing the action of chlorine on wax. The new product thus formed is almost always analogous in its nature to the compound from which it is produced; thus, according as the substance acted on by the chlorine is an acid or a base, the resulting product is an acid or a base, and the number of atoms is always the same in the original substance and the product. The following examples will elucidate the above remarks: If acetic acid, $C_4H_4O_4$, be exposed to the action of chlorine, we obtain, according to the duration and modifications of the action, the two compounds, monochloroacetic acid, $C_4H_3ClO_4$, and trichloroacetic acid, $C_4HCl_3O_4$, in the former of which, one atom, and in the latter, three atoms of hydrogen, are displaced by a corresponding number of atoms of chlorine. Hydrochloric ether, C_4H_5Cl , may be made to yield the following succession of compounds, in which a gradually increasing amount of the hydrogen is displaced by chlorine, until, in the final result, the hydrogen has altogether disappeared. The consecutive compounds thus resulting from hydrochloric ether, C_4H_5Cl , are (1) chlorinated ether, $C_4(H_4Cl)Cl$; (2) dichlorinated ether, $C_4(H_3Cl_2)Cl$; (3) trichlorinated ether, $C_4(H_2Cl_3)Cl$; (4) tetrachlorinated ether, $C_4(HCl_4)Cl$; and (5) sesquichloride of carbon, $C_4(Cl_5)Cl$. "The chlorine," says prof. Miller, "appears to have taken the place of hydrogen in the group without disturbing the relative position of the other elements which enter into its formation; just as a brick in an edifice may be conceived to admit of being removed, while its place is supplied by a block of wood or of stone, without altering the form or symmetry of the building." Substitutions of bromine and iodine for hydrogen may be effected in the same way as has been shown to occur in the case of chlorine. The study of the artificial formation of organic bases has led to the discovery of many remarkable instances of substitution products. If, for example, bromide of ethyl, C_4H_5Br , is heated in a sealed tube with a solution of ammonia in alcohol, hydrobromate of ethylia (or ethylamine) is formed, and on distilling this vapor with hydrate of potash, one of the products is a new base, ethylia, C_4H_7N , which may be regarded as ammonia, NH_3 , in which one atom of hydrogen has been displaced by one atom of ethyl, C_2H_5 . By a similar proceeding, we may successively displace the second and the third atoms of the hydrogen in the ammonia; and we thus obtain two more complex bases, diethylia, C_6H_9N , and triethylia, $C_8H_{11}N$.

SUBTRACTION, one of the four fundamental processes of arithmetic, is the diminution of a quantity by the removal of a certain portion of it. It is consequently the reverse of *addition*, and determines how much of any quantity remains after a certain quantity has been taken from it. In cases where the digits of the number to be subtracted are greater than the corresponding ones of the number to be diminished, two methods of operation may be adopted.

(1)	(2)	(3)
7324	7 (13) (12) 4	6 (12) (12) 4
1843	(2) (9) 4 2	1 8 4 2
5482	5 4 8 2	5 4 8 2

For example, in subtracting 1842 from 7324, the numbers are written as in form (1). The method of operation usually followed is to make an addition mentally to the upper figure when necessary, and then compensate for this by an equivalent addition to the next under figure, as represented in form (2). Thus 10 "tens" are added to 2 "tens," to enable 4 "tens" to be subtracted; and this addition is compensated for by an equal increase of the under line by 1 "hundred," through the change of 8 "hundreds" into 9 "hundreds." The more simple and directly intelligible plan, shown in form (3), is to borrow a unit of the next higher degree in the upper line, care being taken to remember in the partial subtraction immediately succeeding, that the upper digit must be considered as less by unity than it appears.

SUBWAYS. The system of engineering *beneath* the public streets has not by any means yet reached its full development. Subways for foot passengers are occasionally constructed in connection with railway termini: one such connects the Bishopsgate street station of the Metropolitan railway with the Liverpool street station of the Great Eastern; another connects two Victoria stations at Pimlico, belonging to different lines and companies. The *Tower Subway* is a remarkable instance of a passage under the Thames for foot-passengers. The Metropolitan or underground railway, opened in 1863, was the first example of its kind; the passengers going down stairs from the side-pavements to stations underneath the carriage-way. The pneumatic propulsion of mail-bags (see PNEUMATIC DISPATCH) has given rise to projects for a similar mode of propelling railway trains beneath streets and roads. One such, the Waterloo and Whitehall railway,

was commenced about 1865, to pass under the Thames; want of funds led to its abandonment after shafts had been sunk. The term *subways* is usually applied, not to such tunneled passages for traveling, but to roomy archways that will contain sewer-pipes, water-pipes, and gas-pipes. It has been long considered a defective system that whenever such pipes need repair, the surface of the street has to be broken up to get at them, thereby causing great expense and great interruption to traffic. When the metropolitan board of works commenced their series of improvements, they resolved on the trial of subways for this useful purpose. They began with a new street, extending from Covent Garden market to St. Martin's lane, opened in 1861. Underneath the carriage-way of this street, there is a subway, a central arched passage or tunnel 12 ft. wide by 6½ ft. high; with arched side-openings for house service-pipes connected with the cellarage of the several dwellings. In this subway are water-pipes, gas-pipes, and electro-telegraphic wires, all easy of access by side entrances to the subway, of sufficient size to admit workmen, pipes, etc. In this instance, the main sewer is not in the subway itself, but underneath it, provided with man-holes, gullies, ventilating shafts, etc. A second example is afforded by Southwark street, lately formed from Blackfriars road to the southern foot of London bridge. Underneath this street extends a subway, excellently planned for the purposes above mentioned. Two street lamp-posts, of unusually elegant design, one at each end of the street, act as ventilating shafts for the subway, and there are other ventilators along the route, besides side entrances for workmen. A curious proof has been furnished, however, of the anomalies which so frequently mar our public works. In 1865, a gas company broke up the roadway, and broke through the well-built crown of the arch of the subway, to get at their gas-pipes for purposes of repair or adjustment. It was found, on investigation, that no one had power to prevent them. The act empowered the metropolitan board of works to make a subway for the use of gas companies, water companies etc.; the gas company, on the other hand, were empowered by *their* act to break up the public roadways to get at their pipes; the board could not compel the company to adopt the new plan, because the powers were only permissive, not obligatory. The water companies and gas companies fear incurring additional expense; and there is known to be a difference of opinion among engineers concerning the danger from leakage and explosion when the two sets of pipes are inclosed in the same archway.

The subway system, after overcoming these and other difficulties, has made a great advance within a recent period. Queen Victoria street, and several other new streets, have been provided with subways similar to that under Southwark street. The Victoria or northern Thames embankment presents some fine examples of subway engineering. Between the masonry of the river-wall and the former line of high water, there are no less than three tunnels or arched passages under the surface of the ground parallel to the course of the river. One is the metropolitan district railway; another is the low-level sewer of the Great Main Drainage system; while a third is a subway to contain gas and water-pipes, telegraph wires, etc. The most extraordinary plan, perhaps, ever seriously proposed in subway engineering is connected with the spot where Tottenham Court road, Euston road, and Hampstead road join. The Metropolitan railway is here flanked on either side by sewers; above it, but below the level of the street, are several gas and water pipes, drains, and ventilating shafts; while crossing immediately over the Metropolitan railway, at right angles, is the tube of the (still abortive, 1879) pneumatic dispatch (q.v.). Beneath all this is the section of another tunnel, intended to join the Midland and North-western railways with the South-eastern. Civil engineers and contractors are ready to grapple with the difficulties of this extraordinary work whenever financial circumstances are favorable.

SUCCESSION is a legal term used in Scotland, but not used technically in England, where the same subject is spoken of under the name of next of kin (q.v.), and descent; see also **INTESTACY**, **STATUTES OF DISTRIBUTIONS**, **EXECUTORS**, **ADMINISTRATOR**. In Scotland the term is used to denote the taking of property by one party in place of another. Where the devolution takes place in consequence of a conveyance from the proprietor, the acquirer is termed a singular successor, as the conveyance is the single title under which he acquires. Where, however, the person dies intestate, his heir succeeds to the whole of the heritage, and is called the universal successor. Where no will or disposition by the owner is executed, the law makes a disposition for him, and distributes the property according to certain rules of relationship by blood. 1. In the case of heritable succession, primogeniture (q.v.) is the rule, the eldest son and his issue taking the property; and after that stock is exhausted, the next eldest son; and so on. When males fail, then the succession opens to the daughters, who take not in order of seniority, but all together, and are called heirs portioners (q.v.). When descendants fail, then the succession goes to collaterals; thus, brothers and sisters succeed first—the brothers according to a certain priority, and, failing them, the sisters all together as heirs-portioners. When the descendants and collaterals are exhausted, the succession then goes to ascendants (the mother, however, being entirely excluded), the father first, and then uncles and aunts, etc. In heritable succession, the right of representation exists, i.e., when an heir is dead, his children represent him, and take that share which, if alive, he would have taken. Brothers and sisters consanguinean, i.e., by the same

father, but not by the same mother, succeed after brothers and sisters german (i.e., by the same father and mother), before the remoter line of the full blood. The English law of descent or succession differs considerably from the above. See *INTESTACY*, and Paterson's *Comp. of English and Scotch Law* (2d ed.), s. 751, *et seq.*—2. As to succession in movables, or to the personal property of the intestate, see *KIN, NEXT OF*. There are taxes called succession duties, which are payable to the revenue on all property, real and personal, acquired by succession. The duty payable on lineal issue or lineal ancestors is 1 per cent; by brothers and sisters and their descendants, 3 per cent; and so on, the duty increasing as the relationship is more distant. The husband or wife of the proprietor is exempted from the duty.

SUCCESSION ACTS. From a comparatively early period in English history, parliament occasionally exercised the power of limiting or modifying the hereditary succession to the throne. The first instance of such interference occurred in the reign of Henry IV., who possessed himself of the crown, to the prejudice of the descendants of Lionel, duke of Clarence, second son of Edward III. Act 7 Henry IV. c. 2 confirmed the title of that monarch, and declared prince Henry heir-apparent of England and France, with remainders to Henry IV.'s other children. Parliamentary interposition was subsequently exercised in the case of Henry VII. and in regard to the immediate successors of Henry VIII. The respective rights of James I., Charles I., and Charles II. were acknowledged by parliament; and in the case of Charles II. the crown was held to have devolved on him immediately on the death of his father.

The revolution of 1688 was founded on the so-called abdication of the government by James II. See *ABDICATION*. The convention bestowed the crown on William and Mary for life, and regulated the claims of Anne. On the impending extinction of the Protestant descendants of Charles I., the crown was settled by 12 and 13 Will. III. c. 2, in the event of the death of William and Anne without issue, on the next Protestant line, according to the regular order of succession—viz., the descendants of the electress Sophia of Hanover, granddaughter of James I.; and it was at the same time enacted, that whoever should hereafter come to possession of the crown, should join the communion of the church of England as by law established. This is the latest parliamentary limitation of the crown; but the right of parliament to limit the succession has been secured by 6 Anne, c. 7, which attaches the penalties of treason to the "maliciously, advisedly, and directly" maintaining, by writing or printing, that the king and parliament cannot make laws to bind the succession to the crown, and the penalties of a *præsumptio* (q.v.) to maintaining the same doctrine by preaching, teaching, or advised speaking.

SUCCESSION WARS were of frequent occurrence in Europe, between the middle of the 17th and the middle of the 18th centuries, on the occasion of the failure of a sovereign house. The most important of these wars was that of the Orleans succession to the Palatinate (1688-97), closed by the peace of Ryswick; of the Spanish succession (1700-13); of the Polish succession (1733-38), closed by the peace of Vienna; of the Austrian succession (1740-48); and of the Bavarian succession (1777-79), called, in ridicule, the potato-war. Of these, the second and fourth were by far the most important, and a brief notice of their course and conclusion is subjoined.

SUCCESSION, WAR OF THE SPANISH, arose on the death, without issue or collateral male heirs, of Charles II., king of Spain, Nov. 3, 1700. The nearest natural heir to the throne was of the royal line of France, Charles's elder sister having married Louis XIV.; but to prevent any possible union of the two crowns, a solemn renunciation had been exacted both from Louis and his queen, for themselves *and their heirs*; and this renunciation having been ratified by the king and cortes of Spain, was made as binding as legal forms could make it. Failing the Bourbons, the next heirs were the descendants of the younger sister of Charles, who had married the emperor Leopold I., and from whom no renunciation had been exacted; and the only issue being a daughter, who had married the elector of Bavaria, and borne a son, Joseph Ferdinand, this prince was during his lifetime regarded both by Charles II. and the Spanish people as the rightful heir. But, dying in 1699 without issue, the question of succession was reopened, Louis XIV., failing his wife's rights, claiming for himself, as the son of Philip IV.'s elder sister (being, however, again legally barred here by another solemn renunciation); while the emperor Leopold, maintaining with justice that the Bourbons were by these two renunciations wholly deprived of all their rights of heirship, claimed the throne as the son of Philip IV.'s younger sister. The other powers of Europe, especially Britain, Holland, and Germany, warmly interested themselves in the matter, as a question of policy, and with good reason; for not only was the crown of Spain a valuable prize in itself, carrying with it the sovereignty of the Netherlands, the Milanese, Naples, and Sicily, and immense possessions in America, but its union with France or Austria would of a certainty endanger the independence of every other sovereignty in Europe. Both claimants bade for the support of the maritime powers, the one by renouncing his claims in favor of his second grandson, Philip of Anjou, the other by putting forward his second son, Charles, as his substitute, while both solemnly promised never to undertake the union of the two crowns. The Austrian party at first preponderated in Spain; but Louis, by able and unscrupulous policy, succeeded in undermining the Austrian influence at Madrid, and in having Philip declared the heir (Oct. 2, 1700). On the death of king Charles, a month

after, Philip appeared in Spain, and was well received by all classes, and at once recognized as monarch, an example gradually and unwillingly followed by all the European powers excepting the emperor; for at that time the dread of Louis XIV.'s power pressed like an incubus on the nations of Europe. However, the French monarch, by various ill-advised acts, chiefly by his support of the elder pretender (the son of James II.), whom he recognized as sovereign of Britain, and by occupation of the Netherlands and menacing treatment of Holland, stirred up such general resentment, that William III. was enabled to revive the *grand alliance*, and his successor, Anne, to join with Holland and Austria in declaring war against France and the "Spanish usurper," May 15, 1702.

Hostilities at once commenced; a combined British-Dutch-German army under Marlborough attacked the French in Belgium, and captured one by one their fortresses on the Maes, while the Reichs army (Germany having declared for Austria), under the Markgraf of Baden, crossed the Rhine, and took Landau. Austria herself had, however, commenced the contest in the previous year by sending into Italy prince Eugene (q.v.) of Savoy-Carignan at the head of a veteran army of 32,000 men, who did a good deal of hard fighting, with no adequate result. Meanwhile, the elector of Bavaria raised an army and declared for France, and a French army under Villars marched to join him. Both were kept in check by the Markgraf for some time; but, in the summer of 1703, Villars burst through the Black Forest, and joined the elector, with the view of penetrating through Bavaria into Austria, but his obstinate ally, the elector, was determined to invade the Tyrol instead, and join Vendome in northern Italy—a scheme which ended most disastrously; and Villars returned in disgust to France. In the Low Countries, Marlborough employed himself in gradually depriving the French of their strongholds: in Italy the Austrians were driven from point to point, till nothing remained to them but a few districts on the Po; they were, however, relieved toward the close of the year by the defection from France of the duke of Savoy, who joined the grand alliance Oct. 25, 1703, an event which compelled Vendome to return to Piedmont. The first great blow was struck in the following year, when the combined Austrian-German-British army, under Marlborough, totally defeated the French and the elector at Blenheim (q.v.), driving the débris of their forces almost to the foot of the Vosges. After this the French never obtained a permanent footing in Germany. The campaigns of Marlborough in Germany, and of Eugene in Italy, in 1705, were successful but not very important. The year 1706 was another great epoch in this protracted contest; the British and Dutch having freed the valley of the Maes, had forced the French into South Brabant, and Marlborough having, by a stratagem, caused them to march toward Namur, suddenly attacked them at Ramillies (q.v.), and, after a brief combat, put them completely to rout with great slaughter, the elector and Villeroy, the joint commanders, narrowly escaping capture. Louis hastily re-enforced his army, and recalled Vendome from Italy to take the command, a step which, however necessary, cleared the way for Eugene who completely out-generaled his opponent Marsin, and after a memorable march of 34 days, appeared before Turin, and united with the duke of Savoy. The battle of Turin, in which the gallant Marsin was slain, was one of the most obstinate of the whole war, but its result was as decisive, and from this period the French power in northern Italy was shattered: and the following year saw the country completely cleared of both French and Spaniards. From 1706 the war in Germany was purely defensive, and no battle worthy of notice was fought. In Italy also the contest on the whole languished, though the Austrian arms were for the most part successful, Mantua and Naples (1708) being subdued, and the pope compelled to preserve neutrality by dread of another sack of Rome. But since the commencement of 1704, another theater of war had been established by the landing of the archduke Charles at Lisbon with 8,000 British and 6,000 Dutch troops, who were joined by the Portuguese (their king having acceded to the alliance against France), and invaded Spain from the west; but nothing of consequence was accomplished till a landing had been effected by the earl of Peterborough (q.v.), with a small body of troops, in Catalonia. Then attacked both from the w. and e., the Bourbon forces were beaten and driven across the Pyrenees, and it was only after the departure of Peterborough that Berwick (q.v.) made head against his antagonists. By his victory at Almanza (April 25, 1707), he recovered the whole of Spain except Catalonia. In 1710 Berwick finally left Spain; and the Carlists under Stanhope and Starhemberg again got the upper hand, repossessing themselves of the e. of Spain, and of Madrid (Sept. 28). But the arrival of Vendome speedily changed the face of affairs. Stanhope was defeated and captured (Dec. 9) at Brihuega, and Starhemberg was forced to retreat on the following day. The war was thenceforth confined to Catalonia, and was distinguished by no noteworthy incidents. The most important part of the struggle had been meanwhile taking place in the Netherlands, where Marlborough (1707) drew up in concert with Eugene a secret plan of operations which affected a division of the Moselle army under the elector and Berwick from that of the north under Vendome; whereupon the British and Germans swiftly uniting fell upon Vendome's army at Oudenarde (q.v.) (1708), and before Berwick could come up to its aid, inflicted upon it a severe defeat. The capture of Lille, Ghent, and Bruges necessarily followed. France now began to show symptoms of exhaustion, and made overtures of peace, but these being chiefly illusory, were rejected; and the emperor having largely re-enforced Eugene, the allies took the field with 110,000 men,

while the French, equal in strength, were now directed by Villars, the most enterprising and fortunate of their generals; but his star, which had hitherto been constantly in the ascendant, fell before that of Marlborough at Malplaquet (q.v.) (Sept., 1709). After some further campaigning, besieging, and negotiating, the opportune death of the emperor (April 17, 1711) rescued France from the brink of destruction; for Britain became immediately lukewarm in support of a cause which would effect the reunion of Austria and Spain; and the tories having come into power, private preliminaries of peace were signed between Britain and France, Oct. 8, 1711. Eugene, however, continued the war, aided by Holland, and captured Quesnoy; but the defeat and capture of the earl of Albermarle and the British contingent at Denain (July, 1712) so weakened his force, that he was compelled to give way; and in the following spring the Dutch joined the British as parties to the peace of Utrecht (q.v.). The emperor Charles was also forced to conclude a treaty of peace at Baden, Sept. 7, 1714, which ended the struggle, leaving Philip in possession of the Spanish throne (see UTRECHT. PEACE OF); while Austria obtained the Spanish Netherlands and the Milanese.

SUCCESSION, WAR OF THE AUSTRIAN. The death of the emperor Charles VI. (Oct. 20, 1740), by which the male line of the house of Hapsburg became extinct, was the signal for a general uprising of the powers of Europe, some to prey on the Austrian possessions, and others to aid the eldest daughter and heir of the deceased emperor. The probability of such a contingency had long been foreseen by Charles VI., for as early as 1713 he had published a *Pragmatic Sanction* (q.v.), stipulating that, in default of male heirs, the whole of his dominions should descend undivided to his eldest daughter, Maria Theresa (q.v.); and it was almost his sole aim, during his subsequent reign, to gain the consent of all parties having proximate claims to any of the Austrian domains, and of the principal powers of Europe, to this arrangement. The elector of Bavaria, Charles Albert, alone refused to resign his pretensions. On the death of her father, Maria Theresa intimated her accession to the various European powers, and from all of them, except France and Bavaria, received assurances of good-will and support; but notwithstanding, two months did not elapse till Frederick II. of Prussia, without a declaration of war, invaded Silesia. The Austrian treasury was at this time exhausted, and the army much disorganized; so that little or no effective resistance could be made to the Prussians; while the state of alarm into which this sudden attack had thrown the court of Vienna was increased by doubts as to the intentions of France. These doubts were soon resolved by the latter, in the spring of 1741, forming a confederacy of all the claimants to the Austrian dominions—the electors of Bavaria and Saxony, sons-in-law of the emperor Joseph I.; Philip V. of Spain; Charles Emmanuel of Sardinia, who claimed the Milanese; and Frederick II. of Prussia, who *now* demanded almost the whole of Silesia. On the other hand, Britain granted Maria Theresa an annual subsidy of £300,000; the Dutch were willing to aid her when opportunity offered; and Hungary gallantly responded to her pathetic appeal by sending in thousands her motley population, Magyars, Croats, Slavs, and Toltatches, to fight in defense of their heroic queen. Meantime the Bavarians, in conjunction with the French under Belleisle, overran the greater part of Bohemia. This invasion compelled the queen to buy off her most formidable opponent, Prussia, by the surrender of Silesia and Glatz; and then, while prince Charles of Lorraine kept the French at bay in Bohemia, Khevenhuller, the most enterprising of the Austrian generals, advanced up the valley of the Danube, captured 12,000 French in Linz, overran Bavaria, and on the very day of the elector's coronation as the emperor Charles VII., took Munich his capital (Feb. 12, 1742). But this great success alarmed Frederick II. for the security of his new possessions, and abruptly breaking the treaty, he poured his forces into Bohemia and upper Austria, and gained the battle of Chotusitz (May 17). The same year witnessed increased activity on the part of Britain (the Walpole administration being now in power) and Holland on behalf of Austria; the expulsion of the French and Bavarians from Bohemia; the severance of the king of Sardinia from the coalition against Austria, produced by the bribe of some districts of the Milanese, which, however, he did not obtain till some time afterward; the enforcement of neutrality upon Naples by the threatening attitude of a British fleet off the capital; and, on the other hand, the recovery of Bavaria by the elector.

In May, 1743, Bavaria again fell into the hands of prince Charles and Khevenhuller; count Saxe was driven with great loss from the Palatinate; the "emperor" Charles Albert and the Swedes, disgusted at their ill-success in the war, retired from the contest, so that France and Spain now remained the sole representatives of the once mighty coalition. In 1744, France and Britain, which had hitherto engaged in the conflict only as allies, declared war on each other; and the latter proceeded to destroy piecemeal the French and Spanish shipping on the high seas, and to attack their colonial possessions. For this, however, the successes of Saxe in the Netherlands were a compensation. However, the great successes of Austria on the Rhine, and the ill-concealed ambitious projects of Maria Theresa, again alarmed Frederick II. for Silesia; and he resolved on another attempt to rivet his hold on the much-coveted province before it was too late. Accordingly, he concluded at Frankfurt (May 13, 1744), a secret convention with France, the emperor, the elector-palatine, and the king of Sweden. Bursting into Bohemia with his usual celerity, Frederick II. forced the Austrians at once to return from Alsace, thus enabling the elector to recapture Bavaria; but before prince Charles had time to reach

Bohemia, a fresh levy of 44,000 men, which had been raised by the chivalrous and patriotic Hungarians, joined by 6,000 Saxons, had reached the Prussians, and by cutting off their supplies, and capturing their stragglers and foraging parties, compelled them to evacuate the kingdom with considerable loss. In Italy, the Spaniards, who were now joined by the Neapolitans, were defeated repeatedly, and compelled to retreat down the peninsula; and the king of Sardinia succeeded in preventing the French from effecting a permanent lodgment in n.w. Italy. In January, 1745, the emperor-elect died, and his son, Maximilian Joseph, profiting from his father's misfortunes, declined to take part in the contest, or to allow himself to be nominated emperor, and made peace with Austria. Frederick II., displeased with the meddling and overbearing conduct of France with respect to the approaching imperial election, also sought to come to terms with Austria, by the mediation of Britain, and the peace of Dresden (Dec. 25, 1745) finally withdrew Prussia from the conflict. In Flanders, the fortunes of Austria also declined; and after the victory of Fontenoy (May 11, 1745) she could not prevent Saxe from capturing the chief Belgian fortresses in succession. In Italy, also, fortune declared for the coalition; for the Spanish-Neapolitan army, now re-enforced by the Genoese and Modenese—70,000 men in all—defied all opposition, overran the whole of Lombardy and much of the Sardinian territories, driving the king under the walls of his capital. Similar reverses befell the allies in Flanders during the campaign of 1746; but these were more than counterbalanced by the great successes obtained in Italy, where all the lost fortresses of Lombardy, Parma, and Guastalla, were recaptured, the coalition army totally routed in a great battle near Placentia (June 16), and Genoa overrun and occupied. Another of fortune's favors to Austria was the death of Philip V. of Spain (July 9), which, by depriving that arch-plotter, his queen, of the supreme power, considerably diminished the zeal of the Spanish court in the prosecution of the war. In 1747, the Dutch, who had hitherto escaped the ravages of war, were made practically acquainted with them by Saxe, who, having completely subdued the Austrian Netherlands, invaded and overran Dutch Flanders, routed the unfortunate duke of Cumberland at Laffeldt (July 2), while his celebrated chief of engineers, count Lowendal, after a two months' siege, took Bergen-op-Zoom, Cohorn's masterpiece, a fortress believed by the Dutch to be impregnable. At the commencement of 1748, Britain, France, and Holland sought to bring about a peace, and agreed among themselves to certain preliminaries, which were submitted to Austria and Sardinia; but as one of them was the surrender of Parma and Placentia to don Philip of Spain, the former refused her consent; and her two allies, disgusted at her disregard of the sacrifices they had made on her behalf, at once signed the preliminaries (April 30), and Austria sullenly followed suit on May 18. Much discussion followed, but on Oct. 18, 1748, the treaty of Aix-la-Chapelle (q.v.) put an end to this most disastrous war, which left the Hapsburgs in possession of their hereditary dominions, with the exception of Silesia and some of their Italian provinces. See AIX-LA-CHAPELLE.

SUCCINIC ACID ($C_4H_4O_6 \cdot 2H_2O$) derives its name from its having been originally found in amber (Lat. *succinum*), and is one of the group of dibasic acids of the oxalic acid series, whose general formula is $C_nH_{2n-4}O_6 \cdot 2H_2O$. Succinic acid occurs as a natural constituent not only in amber, but also in the resins of many of the pine tribe, in the leaves of the lettuce and wormwood; and, in the animal kingdom, it has been detected in the fluids of hydatid cysts and hydrocele, in the parenchymatous juices of the thymus gland of the calf, and of the pancreas and thyroid gland of the ox.

One of the most important points in connection with succinic acid is its convertibility into tartaric acid, while tartaric acid may in its turn be reconverted into succinic acid.

SUCCORY. See CHICORY, *ante*.

SUCCULENT PLANTS are those plants remarkable for the thick and fleshy or succulent character of their stems and leaves. This character prevails in the natural orders *cactaceæ*, *mesembryaceæ*, and *crassulaceæ*, but frequently appears also in genera of other natural orders, as in aloe and some other *liliaceæ*. It consists in a peculiar development of cellular tissue. Succulent plants are remarkable for the small number of stomata (q.v.) on the green surface. They are generally found in dry climates, often as almost the only vegetation of the most arid places; although some of them occur in situations where moisture is often abundant; their peculiar structure, however, being apparently intended to adapt them for enduring occasional droughts. Thus, there are not only succulent plants in the Sahara and other deserts, but in Britain, and some of them form a conspicuous feature of the flora of the mountains of Europe—as species of *sedum*, *rhodiola rosea*, etc.—where they are found in situations sometimes abounding in moisture, but occasionally parched—on bare rocks, steep slopes with scanty soil, and the like. By the want of stomata and the store of moisture in their own cellular tissue, they are adapted for the endurance of long droughts. Yet they live in great part by nourishment derived from the atmosphere, rather than from the soil; a fact which may easily be proved by suspending a specimen of the common yellow stonecrop (*sedum aureum*) by means of a string, when it will be found to flourish for a considerable time, and sometimes to preserve its vitality as long as those planted in the ground. In dry tropical countries, succulent plants perform in part the same office which lichens and mosses do in colder regions, in preparing the first mold for future vegetation.

SUCHET, LOUIS-GABRIEL, Duke of Albufera, and marshal of France, was descended from an honorable family, and b. at Lyons, Mar. 2, 1770. He volunteered as a private into the cavalry of the Lyons national guard in 1792, and subsequently became attached to the army of Italy. His rare intelligence and brilliant valor, displayed at Lodi, Rivoli, Castiglione, Arcola, and in numerous battles of less note, laid the foundation of his military reputation, and in 1798 he became gen. of brigade. The able manner in which he, with a force not one-sixth of that of the Austrians, kept Melas in check (1800), preventing the invasion of the s. of France, and ultimately capturing 15,000 prisoners, is one of the most brilliant military feats on record. Suchet also took a distinguished part in the campaigns against Austria (1805) and Prussia (1806), and was subsequently (April, 1809) appointed generalissimo of the French army in Aragon, where, for the first time, he appears as holding an independent command. The part of Spain committed to his charge, though inhabited by a people distinguished by their obstinacy and patriotism above all others in Spain, was completely subdued, more, however, through his just and able administration, and the strict discipline which he maintained, than by military talent. The latter quality he was only called upon to exercise against Spanish troops, which he had little difficulty in annihilating. In the first few days of 1812 he conquered Valencia, and obtained in addition to his dignity of marshal (July 8, 1811) that of duke of Albufera, and the grant of a magnificent domain. The five campaigns which he made in the peninsula are considered perfect models of the kind of service he had to perform—viz., to rivet the chains of a foreign domination on the necks of a patriotic and high-spirited people. The details have been well given by him in his *Mémoires sur ses Campagnes en Espagne* (Paris, 1829–34, 2 vols. with atlas). But the misfortunes of the other French armies in Spain compelled Suchet gradually to relinquish all his conquests. He was created a peer by Louis XVIII., but took service under his old master after his return from Elba, and was charged with the defense of the s.w. frontier. Deprived of his peerage at the second restoration, he did not return to court till 1819, when it was restored, and he soon rose high in royal favor. He died at the château of Saint Joseph, near Marseilles, Jan. 3, 1826. Napoleon's high opinion of Suchet's military talents is recorded by O'Meara and Las Casas, and, according to his classification, Suchet ranked second, Massena being first.—His son and successor in the dukedom of Albufera was a member of the corps législatif, and a supporter of the Napoleonic policy under the emperor Napoleon III.

SUCKING-FISH, a name sometimes given to the remora (q.v.), and to fishes of the family discoboli (q.v.), which have a sucker formed by the union of the ventral fins, and are capable of attaching themselves by it to stones or other substances. The best known of the British species, and the only one which is of any value as an article of food, is the lumpsucker (q.v.). Several other species occur on the British coasts, to which the name **SUCKER** is generally given, as the **CORNISH SUCKER** (*lepidogaster Cornubiensis*), and the **UNCUTS SUCKER** or sea-snail (*liparis vulgaris*). They are small fishes, destitute of scales.

SUCKLING, Sir JOHN, one of the brilliant cavalier poets of the court of Charles I., was born at Whitton, in Middlesex, and baptized Feb. 10, 1608–9. His father, also a knight, held office as a secretary of state, and comptroller of the household, but died in 1627, when the poet was in his eighteenth year. The latter inherited large estates; and having completed his education at Trinity college, Cambridge, he went abroad, and served for some time in Germany under Gustavus Adolphus. He returned about 1632, and was soon distinguished for his wit, gallantry, and lavish expenditure. To aid the king against the Scots he raised a troop of 100 horsemen, whom he clad in a rich and gaudy uniform of white and red, with plumes of red feathers in their caps. This loyal corps is said to have cost the poet about £12,000. They rode n.; but no sooner had the cavalry come within sight of the Scots' army at Dunse than they turned and fled without aiming a blow! This disgrace gave occasion to numerous lampoons, and to a clever though coarse ballad against Suckling's gay horsemen; but in reality they behaved no worse than the rest of the English army. Their loyal commander next joined in a scheme to rescue Strafford from the Tower, and this being discovered, he fled for safety to the continent. He died, while yet in the flower of his life and genius, in 1641 or 1642. Various accounts are given of the circumstances attending his death, but the most painful of these, viz., that he poisoned himself in Paris, is confirmed by family tradition. See the memoir by the rev. Alfred Suckling (1836), prefixed to a volume of *Selections from the Works of Sir John Suckling*. He had probably run through his fortune, and dreaded want, as well as despaired of the success of the royal arms. The works of Suckling consist of four plays, now utterly forgotten, a prose treatise entitled *An Account of Religion by Reason*; a collection of *Letters*, written in a stiff, artificial style; and a series of miscellaneous poems, beginning with *A Session of the Poets*, published in 1637, which is original in style, and happily descriptive of the author's contemporaries. But the fame of Suckling rests on his songs and ballads, which are inimitable for their ease, gayety, and pure poetic diction. His ballad of *The Wedding* is still unsurpassed, and one simile in his description of the bride—

Her feet beneath her petticoat,
Like little mice, stole in and out,
As if they feared the light—

has had the honor of being copied by Herrick and Congreve.

SUCRE. See CHUQUISACA.

SUCRÉ, ANTONIO JOSÉ DE, 1793-1830; b. Venezuela; educated at Caraccas. When 18 years old he entered the patriot army, and in 1822 held a command at Pichincha. In 1823 he became the chief of the Peruvian patriots, and the next year won the battle of Ayacucho, which brought about the independence of Peru. By the legislature of Bolivia he was chosen president for life in return for his efforts in rendering that republic free. In 1827 an insurrection took place in which Sucre was wounded. He then resigned, engaged in the war between Colombia and Peru, and defeated the Peruvian army under Lamar at Tarqui, 1829. He was chosen president of the first congress of the republics which met in Bogota, 1830, and on his return was assassinated, it was said, by order of Obando.

SUCTORIA, an order of insects, containing only those forming the Linnean genus *pulex*. See FLEA.

SUDAMINA, or MILIARY ERUPTION, is one of the diseases of the skin belonging to the class *vesicula*, or *vesicles*. The former name is derived from the fact that the disorder is always accompanied with profuse sweating; while the latter has reference to the size of vesicles, which do not exceed those of a millet-seed. The vesicles are most abundant on the neck and trunk, and are sometimes, but not always, attended with itching. They almost always occur in association with febrile disorders, which, however, do not seem in any way modified by these occurrences. The only known condition that favors their production is copious and prolonged sweating. They sometimes appear in health during the summer heat, when strong exercise has induced copious sweating. Pathologically this disease is of so little importance that it is unnecessary to notice its treatment. It is, however, sometimes useful as a sign in diagnosis, especially in typhus and typhoid fevers.

SUDAN. See SOODAN, *ante*.

SUDBURY, a municipal borough of Suffolk, 16 m. s. of Bury St. Edmunds, on the left bank of the Stour, across which a bridge connects the town with the suburb of Balingdon in Essex. The silk and bunting manufactures are the most important branches of industry. There are also brick-works, in which the white clay used is notable for its purity. Malting is carried on. Sudbury was one of the first towns into which the woolen manufacture was introduced by the Flemings. Pop. '71, 6,908.

SUDDEN DEATH may be induced by natural or by violent causes, and the detection of the true cause is obviously of very great importance, since the acquittal or conviction of a suspected person may depend upon it. Sudden death may occur naturally from syncope (fainting or swooning), from asphyxia (literally pulselessness), or, more correctly, apnœa (privation of breath), or from coma (insensibility). Syncope, or sudden cessation of the heart's action, may occur, as Dr. C. J. B. Williams points out in his *Principles of Medicine*, in two ways: (1.) By the heart losing its irritability (or becoming paralyzed), so that it ceases to contract; and (2.) by its being affected with tonic spasm, in which it remains rigidly contracted, losing its usual alternation of relaxation. Sudden death from asphyxia, or, more correctly, from apnœa, occurs when, from any cause, the entrance of air into the lungs is prevented. It is not so often witnessed as a result of disease as of accident. It is sometimes caused by a spasmodic closure of the chord of the glottis (see LARYNX). Sudden death from coma is liable to occur in apoplexy and injuries of the head.

In all cases of sudden death there is a strong tendency on the part of the public to suspect the poisoning. It is very hard to make them understand that persons may die a natural death suddenly as well as slowly; or conversely, that death may really take place slowly, and yet be the result of poison. "One of the means," says Dr. Taylor, "recommended for distinguishing narcotic poisoning from apoplexy or disease of the heart is the difference in the rapidity with which death takes place. Thus apoplexy, or disease of the heart may prove fatal either instantly or within an hour. The only poisons likely to operate with such fatal rapidity are prussic acid or nicotine. Poisoning by opium is commonly protracted for five or six hours. This poison has never been known to destroy life instantaneously or within a few minutes. Thus, then, it may happen that death will occur with such rapidity as to render it impossible, under the circumstances, to attribute it to narcotic poison."—*Op. cit.*, p. 145.

In its relations to medicine and medical jurisprudence the subject of this article has been fully discussed by Herrick and Popp, *Der plötzliche Tod aus inneren Ursachen*, 1848.

SUDETENGEIRGE, the most important mountain-range of Germany, dividing Prussian Silesia and Lausitz from Bohemia and Moravia, and connecting the Carpathians with the mountains of Franconia. It does not form a continuous chain except in the middle, where it is known under the names of Riesengebirge (q.v.) and Isergebirge; the crags, both toward the n.w. and s.e., broadening out into great rugged hilly plateaus, with broken chains and isolated peaks. The Sudetengebirge are composed chiefly of granite, gneiss, mica-schist, and porphyry, with superimposed beds of basalt and coal, and are clothed with pines to a height of between 2,000 and 3,000 feet. They are rich in minerals, especially in the metals, iron, lead, copper, zinc, tin, cobalt, with some silver and gold. Schneekoppe (Snow-peak) in the Riesengebirge, about 5,000 ft. high, is the cul-

minating point in the whole range.—The name Sudetengebirge is applied in a narrower sense to the s.e. portion of the range separating Silesia from Moravia.

SU'DRA is the name of the fourth caste of the Hindus. See **CASTE**.

SUE, MARIE-JOSEPH-EUGÈNE, a well-known French novelist, was born at Paris Dec. 10, 1804. His father, Jean-Joseph Sue, was one of the household physicians of Napoleon, and he educated his son for his own profession. At the age of twenty the young man became an army-surgeon. In this capacity he served in the French expedition to Spain, under the duke of Angoulême, in 1823. Subsequently he transferred himself to the navy; and in 1828 was present at the battle of Navarino. In 1829 his father died, leaving him a handsome fortune, on the acquisition of which he ceased to practice his profession. After coquetting a little with art he betook himself seriously to literature, and very soon, in the department of fiction, he achieved a considerable popularity. His earlier efforts were sea-stories, somewhat after the manner of Cooper, or romances in imitation of Scott; and though in both fields he displayed talent, his true power was scarcely as yet developed. Something of it may, however, be traced in his *Mathilde, ou les Mémoires d'une Jeune Femme*, published in 1841; but it was first decisively made manifest in the famous *Mystères de Paris*, which began to appear the year after in the columns of the *Journal des Débats*. The furor of excitement occasioned by this work and its successor—*Le Juif Errant*—which appeared in the *Constitutionnel*, not only in France but elsewhere, has seldom, perhaps, been exceeded; and for both the writer received large sums of money. In 1846 his *Martin, l'Enfant Trouvé* was issued; in 1847-8 appeared *Les Sept Péchés Capitaux*; and in 1852 he published *Les Mystères du Peuple*, his last work of any importance. Throughout Sue's latest works there runs a vein of socialism; and at the revolution of 1848 he allied himself with the extremist sect of the republicans. On April 28, 1850, he was elected deputy to the legislative assembly for the department of the Seine, and was assiduous in his duties as such till the *coup d'état* of Dec., 1852, by which he was driven into exile. He retired to Savoy; and at Annecy he died July 3, 1857.

In the writings of Sue great power is displayed; but it is rather of the unhealthy kind, and depends for much of its effect on vicious sources of interest. His books are read once with a fever-heat of curiosity, and scarcely bear re-perusal.

SUE'CA, a t. of Spain, in Valencia, and 23 m. s. of the city of that name, on the Jucar, about 4 m. from the Mediterranean. Brick and tile works are in operation, and there are several flour and rice mills. Pop. 9,100.

SU'ET is a variety of solid fatty tissue, which accumulates in considerable quantity about the kidneys and the omentum of several domestic animals, especially the ox and sheep. Beef suet is extensively used in cookery, while purified mutton-suet under the name of *Serum Præparatum* occurs in the Pharmacopœia, and is obtained by melting and straining the internal abdominal fat. It consists of a mixture of ordinary animal fats with a great preponderance of the most solid of them, viz., stearin, which constitutes about three-fourths of the whole. The pure suet of the Pharmacopœia is "white, soft, smooth, almost scentless; and is fusible at 103°." It is used as an ingredient in cerates, plasters, and ointments. Ordinary melted suet is frequently employed in the same manner as lard, to preserve potted meats or fish and similar articles from the action of the air.

SUETO'NIUS, CAIUS TRANQUILLUS, son of Suetonius Lenis, a tribune of the 13th legion under Otho, was born probably a few years after the death of Nero. He is known to us chiefly as a Roman historian and miscellaneous writer, for his merits as which he is highly praised by the younger Pliny. He was also, it is supposed, a teacher of grammar and rhetoric, and a composer of exercises in pleading; nay, from a letter of Pliny's to him, it may be gathered that he sometimes pleaded causes in person. Pliny procured him the dignity of military tribune, which, by Suetonius's desire, he got transferred to another. Though childless, Suetonius was, through the same friendly agency, presented by Trajan with the *jus trium liberorum*, which, in that reign, was only to be had by great interest. He was afterward secretary of the emperor Adrian, whose favor he had secured. The date of his death is unknown. All his works (among which, as we learn from Suidas, there were several on topics usually treated by grammarians) have been lost, except his *Lives of the Cæsars*, his *Lives of Eminent Grammarians*, and (in part only) his *Lives of Eminent Rhetoricians*. It is by the first of these works that he is most favorably known, replete as it is with information about the twelve Cæsars, from C. Julius to Domitian, which is to be had nowhere else, and abounding with anecdotes which, while they too often prove the profligacy of his heroes, testify to the impartiality of their chronicler. From a period long before the renaissance to the present, these "Lives" have always been favorite reading, and have found numerous editors, the best of whom is still Burmann (Amsterdam, 1736), and numerous translators into nearly every European language.

SUE VI, first mentioned by Cæsar, in whose history (*De bello Gallico*) the name is employed as the collective designation of a great number of Germanic peoples. They occupied a district of indefinite extent on the eastern side of the Rhine, and may have been the same tribes as those subsequently known as Chatti, Longobardi, etc. Cæsar

states that their territory comprised 100 cantons, and was densely wooded, that they had towns (*oppida*), but no strongholds, and that every year a part of the population left their homes to seek employment in war. The Suevi of whom Tacitus speaks (*Germania*, 38, etc.) seem to have dwelt n. and e. of the Suevi of Caesar, extending as far as the Elbe and the Baltic, which Tacitus calls the "Suevic sea." The peoples united under the rule of Maroboduus, the Marcomannic chief, were Suevic, and hence the Marcomanni and Quadi, who figure in the reigns of Marcus Aurelius and Aurélian, are often called Suevi. After the name had fallen into disuse as a collective designation, it reappeared (second half of the 3d c., *Ann. Max.*, etc.) as the name of a people occupying the same territory as the Suevi of Caesar, who appear, however, to have been a mixed race made up of adventurers from different parts of Germany, and who probably took the name of Suevi after possessing themselves of the country. We find them in alliance with the Burgundians, Alemanni, Alani, Vandals, etc. They are among the most notable of the barbaric peoples that broke up the Roman empire in the n.w. and west. Bursting through the passes of the Pyrenees (409 A.D.), they along with the Vandals, overran and wasted Spain (q.v.). Those who remained at home in Germany seem to have spread during the 5th c. e. to the Neckar and the Raube Alps, and as far as Switzerland. The mediæval Swabians were their direct descendants.

SUEZ, until recently, a small, ill-built, wretched-looking town, on an angle of land near the northern extremity of the gulf of Suez, 76 m. e. of Cairo, with which it is connected by railway. The pop. was officially returned, in 1872, as 13,493. It is walled on all sides but that toward the sea, has an indifferent harbor, but a tolerably good quay. Suez of late has been greatly improved. English and French houses, offices, and warehouses have been erected in every direction, and the bazars are assuming a respectable appearance. These bazars are provided with clarified butter from Sinai, with fowls, grain, and vegetables from the Egyptian province of Sharkijeh, and with wool, dates, and cotton. Rain falls but seldom, sometimes not once in three years. All around stretches a burning waste of sands. Suez owes its modern prosperity to the establishment of what is known as the *overland route* (q.v.) to India, in consequence of which a large portion of the traffic between England (and other European countries) and the east passes through the place; and to the opening of the Suez canal in 1869. For a long time previous to the establishment of the overland route, Suez had been in a state of complete decay, although, at a yet earlier period—previous, in fact, to the discovery of the sea-route to India by the cape of Good Hope—it was a flourishing emporium of the products of east and west. A salt manufactory was recently established here by the Egyptian government, and from May to July, 1875, six thousand tons of salt were sent to India.

The **GULF OF SUEZ** is the western and larger of the two branches into which the Red sea divides toward its northern extremity, and washes on the w. the coasts of Egypt, on the e. those of the Sinaitic peninsula. Extreme length, 200 m.; average breadth, about 20 miles. The shores are sometimes low, barren, and sandy wastes, sometimes bold and rocky headlands.

The **ISTHMUS OF SUEZ** is a neck of land 72 m. in width at its narrowest part, extending from the gulf of Suez on the s. to the Mediterranean on the n., and connecting the continents of Asia and Africa. It embraces within its limits (according to the commonly received opinion) the fertile Goshen (q.v.) of antiquity; but it is now a wretched uninhabitable waste, consisting of mingled sand and sandstone, interrupted here and there with salt swamps or lakes, but almost entirely destitute of fresh water. The main interest that attached to this region, in recent times, was, whether or not—since Egypt was on the great highway to India and China—it was practicable to cut a ship-canal through the isthmus. We shall here briefly indicate the main steps that were taken to have this important question solved in a satisfactory manner.

It is certain that, in ancient times, a canal connecting (indirectly) the two seas did exist. At what period it was constructed is not so certain. Herodotus ascribes its projection and partial execution to Pharaoh Necho (about 600 years B.C.); Aristotle, Strabo, and Pliny less felicitously fix on the half-mythical Sesostris as its originator. The honor of its completion is assigned by some to Darius, king of Persia, by others to the Ptolemies. It began at about a mile and a half from Suez, and was carried in a north-westerly direction, through a remarkable series of natural depressions, to Bubastis, on the Pelusiac or eastern branch of the Nile. Its entire length was 92 m. (of which upward of 60 were cut by human labor) its width from 108 to 165 ft., and its depth 15 (Pliny says 30) feet. How long it continued to be used, we cannot tell; but at length it became choked up with sand, was restored by Trajan early in the 2d c. A.D., but again became unusable from the same cause, and so remained till the conquest of Egypt by Amron, the Arab general of the calif Omar, who caused it to be reopened, and named it the "Canal of the Prince of the Faithful," under which designation it continued to be employed for upward of a century, but was finally blocked up by the unconquerable sands, 767 A.D. In this condition it has ever since remained. The attention of Europe was first turned to it in modern times during the invasion of Egypt by Bonaparte, who caused the isthmus to be surveyed by a body of engineers, who arrived at the opinion that the level of the Mediterranean is 30 ft. below that of the Red sea at Suez, an opinion

which a subsequent survey proved to be erroneous. From this time, the question continued to be agitated at intervals, especially by the French, and various plans were proposed, but nothing definite was arrived at till 1847, when France, England, and Austria sent out a commission to measure accurately the levels of the two seas. The commissioners, M. Talabot, Mr. Robert Stephenson, and signor Nigrelli, ascertained that, instead of a difference of 30 ft., the two seas have *exactly the same mean level*. The only noticeable difference was, that there is a tide of $6\frac{1}{2}$ ft. at the one end and $1\frac{1}{2}$ ft. at the other. Another examination leading to similar results was made in 1853. Mr. Stephenson expressed himself very strongly against the feasibility of a canal, that is to say, a canal of such dimensions as would suit the requirements of modern commerce, and planned, instead, a railway from Cairo to Suez, which was opened (1858), and which now conveys overland all our Indian and Australian mails. The French, however, were not satisfied with Mr. Stephenson's conclusions, and M. Talabot, on his return to Europe, published in the *Revue des Deux Mondes* a plan for connecting the two seas by way of Alexandria and Suez (or rather a point 6 m. below Suez), for a description of which we have not space. In 1854 a new experimenter appeared in the person of M. de Lesseps, a member of the French diplomatic service in Egypt, who (1856) obtained from the pasha the "concession," i.e., the exclusive privilege of forming a ship-canal from Tyneh (near the ruins of ancient Pelusium) to Suez. The peculiarity of M. de Lesseps's plan lay in this, that, instead of following an oblique course, and uniting his canal with the Nile, as the ancients had done, and as all the modern engineers had thought of doing, he proposed to cut a canal right through the isthmus in a straight line to Suez. This canal was to have a minimum width at the surface of 262 ft., and at the bottom of 144 ft., with a depth of $22\frac{1}{2}$ ft.; and at each end there was to be a sluice-lock formed, 330 ft. long by 70 wide. By taking advantage of the tides at Suez, it was hoped that an additional depth of 3 or 4 ft. might be obtained. But the colossal feature of M. de Lesseps's plan was the artificial harbors which he proposed to execute at the two ends, Tyneh and Suez. That at the Mediterranean end was to be carried out 5 m. in order to obtain a permanent depth of water for a ship drawing 23 ft., on account of the enormous quantity of mud-sand which the Nile annually pours out (30,000,000 cubic yards, it is said), and which the prevalent wind drives eastward along the shore toward the southern coast of Palestine. The quantity of stone required to construct this harbor has been calculated variously at from 3 to 12 million cubic yards, and there are no stone quarries except at a great distance from Tyneh! The pier at Suez was to be carried out 3 m., and in other respects the difficulties, though great, were not, as on the Mediterranean coast, *almost insurmountable*. The English for political, perhaps, as well as for practical reasons, looked with aversion on M. de Lesseps's scheme; but in 1855, the question was again taken up in an international spirit, a new European commission was appointed, which reported that M. de Lesseps's scheme, somewhat modified, *was practicable*, and that a canal might profitably be constructed. The result of the report was the formation of a joint-stock company, with a subscribed capital of £8,000,000 (afterward increased), in which Saïd, the pasha of Egypt, took a large number of shares, and made large concessions of land; and the work was accordingly begun. The canal was to be dredged through lake Menzaleh, which runs far into the land directly toward Suez, to be connected with lake Tensuh, the Bitter lake, and other marshy swamps, and so with Suez. Only a third of the way required to be excavated through the sands and rocks of the desert. As early as Dec., 1864, the Mediterranean and the Red sea had been connected. The communication, however, was not throughout by the permanent maritime canal, but simply by a fresh-water canal of no great width or depth. In April, 1865, the works, at the request of M. de Lesseps, were visited by another scientific commission, who reported more favorably of the scheme than was expected in England. They stated that the "construction of a ship-canal across the isthmus is only a question of time and money," and they added that three years would suffice for the completion of the various contracts connected with the undertaking.

The canal was formally opened in Nov., 1869. An account of the opening, and a description of the canal in its completed state, is given under **SUEZ CANAL**.

The hostility of the British nation to the canal faded away with its successful completion and the advantages which it afforded to British commerce. The fears expressed at the opening of the canal, that the trade of the east would be diverted from Great Britain as a center, were found by statistics to be as groundless. In 1875 the British government purchased, for £4,000,000, the khedive of Egypt's shares in the canal, which amounted to 176,602 out of 400,000. These shares give no returns to their owner till 1894, the khedive having alienated the dividends till that period in favor of the company.

SUEZ CANAL. In the former article on this subject, the nature of the scheme was briefly described, and illustrated by a small map; and the progress of the works noticed down to the year 1865. In this place, some of the features will receive a little further explanation, now that the canal is finished and in operation. The canal is 85 m. long.

The Port Said Entrance.—Port Said or Saïd, a t. now containing 10,000 inhabitants had no existence in 1860. It became the depot of the company, the metropolis of vast bodies of laborers and other persons employed on the works of the canal. As the Mediterranean sea is very shallow near this point, an artificial deep channel had to be made

bounded e. and w. by piers stretching far out into the sea. Stone for these piers was, in the first instance, brought from a long distance; but afterward artificial stone was made on the spot, consisting of two parts of sand and one part of hydraulic lime ground into a paste, and poured into wooden boxes or moulds. When the mixture solidified, the mould-boards were removed, and the solid blocks of artificial stone were left from three to six months in the open air to dry and harden. The blocks contain 10 cubic meters each, weigh 20 tons, and were made at a contract price of 42 francs per *mètre cube*. The western pier has a length of 7,000 ft., and the eastern of 6,000 ft.; they are 4,600 ft. apart at the shore, but gradually approach toward each other, so that their outer ends are only 2,300 ft. apart. The western pier is continued in an arc of 1100 yds. extent, so as, with the eastern pier, to shelter the harbor from all winds. Within this outer harbor is an inner port, 870 yds. by 500, which is kept at a uniform depth of 30 ft., by means of steam-dredging. The lighthouse, with its electric light, is 180 ft. high.

From Port Said to Tensah Lake.—From Port Said, the canal crosses about 20 m. of Menzaleh lake, a salt-water shallow, closely resembling the lagoons of Venice, having from 1 to 10 ft. depth of water. The canal through this lagoon is 112 yds. wide at the surface, 26 yds. at the bottom, and 26 ft. deep. An artificial bank rises 15 ft. on each side of this channel. Beyond Menzaleh lake, heavier works begin. The distance thence to Abu Ballah lake is 11 m., with a height of ground above the level of the sea varying from 15 to 30 ft. Crossing the last-named lake, there is another land distance of 11 m. to Tensah lake, cutting through ground to a depth varying from 30 to 70 or 80 ft.; and then 3 m. further across this little lake itself. At El Guisr, or Girsch, occurs the deepest cutting in the whole line, no less than 85 ft. below the surface; at the water-level it is 112 yds. wide, at the summit-level 173 yds., from which the vastness of the gap may be estimated. Ismailia (pop. 5,000) on Tensah lake, is regarded as the central point of the canal. While the canal was being made, it grew up rapidly from an Arab village to a French town, with the houses of engineers and managers, hotels, shops, cafés, a theater, and a central railway station, from which railways stretch to Alexandria and Suez.

The Fresh-water Canal.—This extends from the Nile to Tensah lake, and was constructed purposely to supply with water the population accumulating at various points on the line of the canal; but is also used by small sailing-vessels. This fresh-water or "sweet-water" canal comprises three portions or sections: (1) from the Nile e. or n.e. to Ismailia, on Tensah lake; (2) from Ismailia, nearly s. to Suez, on the western side of the great ship or maritime canal; (3) from Ismailia nearly n. to Port Said, also on the w. side of the ship canal. The first and second of these sections are really canals, large enough to accommodate small steamer and barge traffic; but the third section consists simply of a large iron pipe, through which the water is conveyed to the several stations. Plugs are inserted in the pipe wherever needed, to allow water to be drawn off for everyday wants.

From Tensah Lake to Suez.—The route crosses Tensah lake to Toussoum and the Serapeum cutting, through a plateau 46 ft. above the sea, where the waters were let in by the prince and princess of Wales, Feb. 28, 1869. There is a space of 8 m. from Tensah lake to the commencement of the Bitter lakes, which had to be dug to a depth varying from 30 to 62 ft., according to the undulations of the surface. In these deep cuttings, owing to the great width of the canal, the quantity of sand to be dug out (for it is nearly all sand, though sometimes agglomerated with clay) was enormous, requiring the constant labor of a large number of powerful dredging machines and elevators. In passing through the Bitter lakes, there was more embanking than excavating to be done, seeing that the bottom of this region is only two or three yards above the intended bottom of the great canal. From the southern end of the Bitter lakes to Suez, a distance of about 13 m., there is another series of heavy cuttings through the stony plateau of Chalouf, varying from 30 to 56 ft. in depth. Where cutting is thus difficult, the surface width is reduced considerably from the regular width of 327 feet. The canal is intended throughout to be 72 ft. wide at the bottom, and 26 ft. deep.

On Nov. 16, 1869, the Suez canal was opened in form, with a procession of English and foreign steamers, in presence of the Khedive, the empress of the French, the emperor of Austria, the crown-prince of Prussia, and others. On Nov. 27, the *Brazilian* went through; a ship of 1809 tons, 380 ft. long, 30 ft. broad, and drawing from 17½ to 20½ ft. of water. Since then, the canal has continued in successful operation, and passages have been made almost daily, chiefly by British vessels. The cost of construction of the canal was said to have reached, in Dec. 1869, the total of £11,627,000. In 1870, 491 ships, of 436,618 tons, passed through; and in 1874, 1264 ships, of 2,424,000 tons. About 70 per cent of the shipping and tonnage belongs to Great Britain. The great advantage of the canal is, of course, the shortening of the distance between Europe and India. From London or Hamburg to Bombay is by the cape about 11,220 m., but by Suez only 6,332; that is, the voyage is shortened by 24 days. From Marseilles or Genoa there is a saving of 30 days; from Trieste, of 37. The rate at which steamers are allowed to pass through, is from 5 to 6 knots an hour. The canal charges are, 10 francs per ton, and 10 francs per head for passengers. The receipts for 1873 amounted to 22,755,862 francs, or £911,032; for 1875 (when 1494 ships passed through), to 28,879,735 francs, or £1,155,185; for 1876 (1457 ships passed), 31,143,762 francs (£1,245,750).

SUFFOCATION. See ASPHYXIA and RESPIRATION.

SUFFOLK, a co. in e. Mass., on Massachusetts bay, containing the cities of Boston and Chelsea, the townships of Revere and Winthrop, and some small islands in Boston harbor and Massachusetts bay; 44 sq.m.; pop. '80, 387,626. Its manufactories numbered, in 1870, 2,546, requiring \$48,000,000 capital, giving employment to 43,557 persons; the raw material used amounted to \$60,000,000, and produced \$112,000,000 in value. The county is one of the smallest in the state, and the second in population. Co. seat, Boston.

SUFFOLK, a co. in s.e. New York, bounded on the n. by Long Island sound, on the s. by the Atlantic ocean, watered by the Peconic and other rivers, traversed by the Long Island and the Southside railroads; about 850 sq.m.; pop. '80, 53,926—48,319 of American birth. It includes the central and e. portions of Long Island. The surface is level except in the north. The soil is sandy, but yields well by the use of fertilizers. The principal productions are corn, oats, wheat, wool, grass, and dairy products. The coast is indented by numerous bays, which make good harbors. There are ship-yards, flour-mills, and manufactories of cottons and woollens, paper, bricks, etc. Co. seat, Riverhead.

SUFFOLK, a maritime co. of England, bounded on the e. by the German ocean, on the n. by Norfolk, and on the s. by Essex. Area, 947,681 acres; pop. '71, 348,475. The surface is for the most part flat, falling away into marshes on the n.w. and n.e. borders. The coast-line, which is low and marshy, or lined with cliffs of shingle or gravel and red loam, is about 50 m. in length, and is, on the whole, regular, being unbroken by any considerable indentation, and comprising no headland worthy of notice except Lowestoft Ness, the most easterly point in Great Britain. The tributaries of the Waveney, which separate Suffolk from Norfolk on the n., and those of the Stour, which form the boundary-line on the s., together with the river Lark, an affluent of the Great Ouse, and the Gipping, which, after it begins to broaden into an estuary, is called the Orwell, are the chief streams. The climate is cold in spring, but is drier than that of the western counties. The soil is of various kinds, some of which are very productive. 770,000 acres are under cultivation, and the most improved system of agriculture has been introduced, together with the best and newest agricultural implements. A polled breed of cattle, of which the cows are deservedly held in high esteem, is peculiar to the county. The Suffolk pigs are a famous and most profitable breed. There are in the co. about 430,000 head of cheep, chiefly Southdowns and crosses of this breed. The ordinary crops are raised. The co. sends four members to parliament. Capital, Bury St. Edmunds.

SUFFRAGAN (Lat. *suffraganeus*, from *suffragium*, a suffrage or vote), the name given to a bishop in a province, in his relation of dependence or subordination to the archbishop, or rather metropolitan, of the province. See METROPOLITAN. In some continental churches, the name is applied to coadjutor-bishops appointed—as in the case of prince-bishops in the German empire—to assist the bishop in his own diocese.

SUFFRAGE (Lat. *suffragium*, derivation uncertain), a right to vote, and more particularly the right possessed by the citizen of a state where representative government exists to vote for a member of the legislative body.

The idea that the universal enjoyment of political suffrage is a right by natural law, is grounded on the fiction that the obligations of municipal law arise out of a social contract express or implied. In opposition to this notion it is argued that the true purpose for which government exists is the general welfare of the nation; and it is the duty of state to consider whether the suffrage may be more beneficially exercised by the many or the few. Infants, minors, idiots, and insane persons have everywhere been excluded from the suffrage, on the ground that sound judgment is necessary for its exercise. Persons convicted of crimes have been excluded, as a security to society; and also almost universally women, for reasons based on their relation to society and to the opposite sex. Like considerations of expediency, it is argued, are a ground for withholding the suffrage from those whose circumstances and station in life render it unlikely that they should form a sound judgment on political questions. It is the intelligence and enlightenment of the country that an elective legislature should represent; and in any large extension of the suffrage there is obviously a risk of the intelligence of a constituency being swamped by its mere numerical majority. A widely extended suffrage has, however, been advocated as a valuable means of educating the people to self-dependence; and several philosophical politicians of the present day, who are favorable to a large extension of the electoral qualification, propose to obviate what they regard as its otherwise inevitable evils by graduating the suffrage, so as to give each individual elector a number of votes corresponding as much as possible to his property, education, or social position. Schemes for this end, differing in detail, have been proposed by Mr. J. Stuart Mill, in his *Considerations on Representative Government* (1851); and by prof. Lorimer in his *Political Progress not necessarily Democratic* (1857), and *Constitutionalism of the Future* (1865). See REFORM, REPRESENTATION, BALLOT.

SUFISM (from *sufi* or *safi*, the Greek *sophos*, a sage; erroneously also derived from Arab. *saf* or *suf*, wool, and thus designating an individual who wears nothing but

woolen garments) designates a certain mystic system of philosophical theology within Islam. Its devotees form a kind of ecclesiastical order somewhat similar to that of the fakirs (q.v.), or dervishes, but they are mostly of a far superior stamp; and some of the greatest Persian poets, philosophers, historians, and even kings belonged to their ranks. They assume four principal degrees of human perfection or sanctity. The first or lowest is that of the shariat—i.e., of the strict obedience to all the ritual laws of Mohammedanism, such as prayer, fasting, pilgrimage, almsgiving, ablutions, etc., and the ethical precepts of honesty, love of truth, and the like. The second degree (tarikāt) is not attainable by all, but only by those higher minds that, while strictly adhering to the outward or ceremonial injunctions of religion, rise to an inward perception of the mental power and virtue necessary for the nearer approach to the divinity, the necessity of, and the yearning for, which they feel. The third (hakikal = truth) is the degree of those who, by continuous contemplation and inner devotion, have risen to the true perception of the nature of the visible and the invisible—who, in fact, have recognized the Godhead, and through this knowledge of it have succeeded in establishing an ecstatic relation to it. This state is finally sublimated into that highest and last degree (maarifāt), in which man communicates directly with the Deity. Practically, the great mass of the people take the lowest degree; the second stage is reached by the “murids,” who do not fulfill the behests of the ceremonial law because they are behests, but because they are good in themselves, knowing that virtue is good; and because it leads to truth, they adhere to it for its own sake. They give alms because the sight of poverty grieves them; their ablutions are as much due to their desire of physical purity as to that of obeying a religious injunction. The third stage is that of the naibs, to whom all this spiritualizing of faith applies in a still more eminent degree. And the highest stage of attainable perfection is that of the murshid, whose words are God’s words, pure and simple, because he is in direct and constant communion with God. He is the “sun of faith,” by whose reflected light shine the naibs, its “moons.” All Sufistic poetry and parlance is to be taken allegorically and symbolically. They represent the highest things by human emblems and human passions; and religion being with them identical with love, erotic terminology is chiefly used to illustrate the relation of man to God. Thus the beloved one’s curls indicate the mysteries of the Deity; sensuous pleasures and chiefly intoxication, indicate the highest degree of divine love as ecstatic contemplation; while the wine-house, of which constant mention is made, merely indicates the state in consequence of which our human qualities merge in or are exalted into those of the Deity. Founded in the 9th c. by Kāfī-Mullāh, this peculiar mysticism has principally struck root in Persia, and chiefly among men of genius, e.g., Hafiz (q.v.). Recently, it has been revived, with slight modifications, by Shāmil, the renowned and once formidable antagonist of the Russians, who undertook to enlist even the common soldiers, if not in the ranks of the initiated—for Sufism, in its real meaning, is very exclusive—at least of its votaries; and the very lowest among them even had a sentence given him indicative of his forming part of the sect and of the gradations that form its main characteristic. In conclusion, it may be observed that Sufism mixes up all religions and all their prophets indiscriminately in one class; and the words idolatry, unbelief, licentiousness, and the like are generally used in their reverse sense by its votaries. Their principal religious writer is Jalāleddin Rumi.

SUFFRAGE (*ante*), under the U. S. constitution is exercised by such electors in each state as have the qualifications necessary for electors of the most numerous branch of the state legislature (art. 1, sec. 2). By the XIV. and XV. amendments the states are forbidden to abridge the privileges or immunities of United States citizens (see PRIVILEGES AND IMMUNITIES), or to deny or abridge the right of suffrage on account of “race, color, or previous condition of servitude.” It seems clear that the states retain the right to impose conditions on suffrage other than those specifically prohibited in the amendments. The age of 21 is universally fixed on as that when suffrage may be exercised by male citizens; conviction for crime, insanity, and pauperism everywhere excludes. In a few states ability to read and write is required, while Rhode Island has a small property qualification. Wyoming territory allows women to vote in all local matters, and Massachusetts in 1879 passed a law allowing women to take part in the town election of school officers; some other states have similar provisions.

SUGAR (Lat. and Gr. *sacchar*, Sans. *sarkara*, Pers. *schakar*, Arab. *sukkar* or *assokkar*, Sp. *azúcar*, It. *zucchero*, Fr. *sucrer*, Ger. *zucker*) is a general term applied by chemists to a number of neutral carbo-hydrates, possessing a more or less sweet taste, for the most part crystallizable, and produced by the vital processes going on in certain plants and animals. They are divisible into two groups, the first embracing such sugars as are capable of undergoing fermentation, and of being resolved, under the action of yeast, either directly or indirectly into alcohol and carbonic acid gas; and the second including those sugars which are not capable of being broken up by fermentation into the above-named products. The first group contains cane-sugar or *saccharose*, fructose or inverted sugar, trehalose, mycose, melezitose, melitose, grape-sugar or glucose (q.v.), and milk-sugar or lactose; while the second group includes inositol or inosin, sorbitol or sorbin, and scyllitol or scyllin.

Cane-sugar or *sucrose* ($C_{12}H_{22}O_{11}$), the ordinary sugar of commerce, is by far the most

important of this class of compounds; and in so far as its sweetening properties are concerned, it exceeds grape-sugar in the ratio of 5 to 2, and milk-sugar in a still higher ratio. It has a specific gravity of 1.6. It dissolves in about one-third of its own weight of cold water, producing a thick viscid syrup, and in all proportions in hot water; it is slightly soluble in absolute alcohol, but spirit of wine of specific gravity 0.830 dissolves about one-fourth of its weight. By the spontaneous evaporation of its watery solution it is deposited in four-sided rhomboidal prisms. Common loaf-sugar and sugar-candy are two well-known forms of crystallized sugar; the former consisting of a mass of small transparent crystals, and owing its dazzling whiteness to the numerous reflections and refractions which the rays of light undergo within the interior from the numberless crystals of which it is composed; while the brown color which the latter usually possesses is due to the coloring matter not having been removed from the syrup previous to crystallization. The crystals of sugar-candy are larger than those of loaf-sugar, in consequence of the slower evaporation in the former case. When crystals of sugar—as, for example, two pieces of loaf-sugar—are rubbed together in the dark, a pale phosphorescent light is evolved. If a solution of sugar be boiled for a long time it acquires an acid reaction and loses its power of crystallizing—a change which is attended by the assimilation of additional water, and the formation of the uncrystallizable inverted sugar which will be presently described. If the boiling be further prolonged the inverted sugar ($C_{12}H_{22}O_{11}$) assimilates more water, and is converted into grape-sugar ($C_{12}H_{22}O_{12}$ + $2H_2O$), while a little formic acid and ulmin (a brown, nearly insoluble substance belonging to the *humus* group) are produced. The crystallization of sugar is also prevented by the addition of a little oxalic, citric, malic, or any of the stronger acids to its solution; and in order to check the bad effects of an acid, a small quantity of lime is usually added to the cane-juice before it is heated.

The action of different degrees of heat on sugar has been carefully studied. At about 320° sucrose fuses, and on cooling forms the transparent amber-colored solid known as *barley-sugar*, which, if kept for a long time, assumes a crystalline state, and becomes opaque. If the application of heat be continued until about 400°, the sugar loses two atoms of water, and *caramel*, which is described in the article GLUCOSE, is formed, and at a still higher temperature, the changes which sucrose undergoes are identical with those suffered by glucose. Sugar dissolves many metallic oxides when its solution is boiled with them—as, for example, freshly precipitated oxide of lead, lime, and baryta, and its presence prevents the precipitation of alkalis of various metallic oxides from their salts—the oxides of copper and of iron being thus retained in solution. Many metallic oxides are partially or entirely reduced when boiled with sugar; thus chromic acid is reduced to sesquioxide of chromium, salts of the red oxide of mercury are converted into those of the suboxide, and salts of gold give a precipitate of the reduced metal. It does not reduce alkaline solutions of oxide of copper to the suboxide (Trommer's test) unless with the aid of heat, which converts it into glucose. Under the action of certain oxidizing agents it may be converted into propionic, formic, and acetic acids. Sucrose is not *directly* capable of undergoing fermentation; but in the presence of a ferment (yeast, for example) it is converted into glucose, and in that form it readily undergoes vinous, lactic, and butyric fermentation. Its action on polarized light is described below.

This variety of sugar is chiefly obtained from the juice of the sugar-cane, but it is also abundantly present in the juices of certain species of maple and of beet-root, all of which yield this substance as a commercial product; it is also contained in sugar-grass (*sorghum saccharatum*), whose juice yields 13 per cent of sugar; in carrots and turnips, in the pumpkin, the chestnut, the young shoots of maize, in the flowering buds of the cœcus palm, and in a large number of tropical fruits. Its use as an article of diet has been already mentioned under DIET. Several articles of food contain some form of sugar in considerable quantity. In peas, there are 2 per cent of sugar; in rye-meal and wheaten bread, about $3\frac{1}{2}$ per cent; in cows' milk, $4\frac{1}{2}$ per cent; in goats' milk and in barley-meal, $5\frac{1}{2}$ per cent; in human milk, in asses' milk, ripe gooseberries, and ripe pears, about 6 per cent; in oatmeal, about 8 per cent; in wheaten flour, from 4 to 8 per cent; in beet-root, from 5 to 10 per cent; in ripe peaches, $16\frac{1}{2}$ per cent; in ripe cherries, 18 per cent; and in dried figs, upwards of 60 per cent. Although sugar is commonly regarded as a luxury, it is in reality a very valuable article of food (as, indeed, might be inferred from its presence in milk, and in both the yolk and white of eggs), since it is very rapidly digested, and supplies heat-forming or respiratory food to the system. "When, however," says Dr. E. Smith, "it is compared with wheaten flour, it is a very dear food, since three or four times more carbon will be obtained for 1d. in flour, besides nitrogen, none of which is found in sugar. It has also been proved by Messrs. Lawes and Gilbert that even its fattening properties—that is to say, its power to form fat in the system, when it is supplied in excess of the quantity which the daily wants of the body require to produce heat—are not greater than those of starch as found in the cheapest grain."—*Practical Dietary*, 1863, p. 63. In consequence of sugar being a fat-forming substance, it should be taken very sparingly in cases of excessive obesity. There are certain forms of dyspepsia in which sugar should be avoided, as exciting increased gastric uneasiness; and in diabetes, all articles of food containing or (like starch) yielding sugar, should be rigidly prohibited. Although prone to fermentation when in a

dilute state, in its concentrated form sugar possesses great antiseptic power, and is extensively employed to preserve both vegetable and animal substances from decay. The sugar naturally existing in some fruits is often sufficient to insure their preservation in a dry state, while in other cases it is added, as in preserves and jellies. A mixture of salt and sugar applied to meat, fish, etc., preserves more of the natural flavor than mere salting does. Sugar converted into caramel is much used by cooks and confectioners as a coloring matter.

Closely allied in their chemical characters to sucrose are the following comparatively rare forms of sugar: (1) *Trehalose* ($C_{12}H_{22}O_{11} + 2Aq$), so called from *Trehala*, or Turkish manna (the product of a coleopterous insect, *Larinus nidificans*), from which this variety of sugar is extracted, differs from sucrose in the following points—it crystallizes in brilliant rectangular octahedra; contains water of crystallization; fuses at 212° , and loses its water of crystallization; is very soluble in hot alcohol; possesses about three times as great a rotatory power on polarized light; and when heated to 356° does not undergo further change. (2) *Mycose*, obtained from ergot of rye, possesses the same composition as trehalose, from which it mainly differs in crystallizing in rhombic prisms, and in exhibiting a somewhat weaker rotatory power. (3) *Melzitose* ($C_{12}H_{22}O_{11}$), obtained from larch manna, differs from cane-sugar in its less sweet taste, and in exhibiting a less powerful rotatory action. (4) *Melitose* ($C_{12}H_{22}O_{12} + 2Aq$), the chief ingredient in the Australian manna yielded by the *eucalyptus* tree, crystallizes in acicular prisms, is feebly sweet, undergoes fermentation with yeast, but yields only half as much alcohol and carbonic acid as would be obtained from an equal weight of glucose, one half of this sugar being converted into an unfermentable syrupy body, known as *eucalyn* ($C_{12}H_{22}O_{12}$).

More important than any of the above varieties, and differing from cane-sugar in a distinctive physical property, is the substance formerly known as *fruit sugar*, but now often described as *inverted cane-sugar*. The objection to the former name is, that the sugar contained in many ripe acidulous fruits, and formerly regarded as a distinct variety, is merely a mixture of cane-sugar, with more or less of the *inverted sugar* ($C_{12}H_{22}O_{12}$), which has already been noticed as resulting from the action of prolonged boiling, or of a little acid on cane-sugar. The same change occurs in many ripening fruits, in consequence of the presence of a peculiar albuminous ferment. Inverted sugar is not crystallizable, is soluble in dilute alcohol, and produces left handed rotation; hence its name. By chemical means, it is convertible into grape-sugar, a change which sometimes occurs spontaneously, as is seen in the gradual crystallization of the sugar in dried fruits.

Grape-sugar, constituting the hard granular sweet masses occurring in old dried fruits, such as raisins, figs, etc., has already been described in the article GLUCOSE, or GLUCOSE, under which names it is commonly known to chemists. It is also known as *starch-sugar*, because it is readily obtained by the action of a dilute acid on a hot solution of starch, and is identical with the sugar occurring in the urine in diabetes.

Milk-sugar, known also as *lactine* and *lactose* ($C_{12}H_{22}O_{12} + 5Aq$, or, according to some chemists, $C_{12}H_{22}O_{11} + Aq$), is a purely animal product. It exists in considerable quantity in the milk, especially of the herbivorous animals, and is one of the most important and essential ingredients in that secretion. It may be obtained on a large scale by separating the curd from the milk, and evaporating the whey till it is ready to crystallize; when, on the introduction of small pieces of wood, the crystals of sugar are deposited on them. These crystals are four-sided prisms of a milk-white color, and so hard that they crunch between the teeth. This variety of sugar is only moderately sweet (*vide supra*), requires about six times its weight of cold water for its solution, but dissolves readily in boiling water, while it is insoluble in alcohol or ether. If it be gradually heated to 284° , two equivalents of water are expelled, whereas, if it be suddenly heated to about 400° , all five equivalents are given off. When pure, milk-sugar is insusceptible of fermentation; but when boiled with dilute acids, it is converted into a directly fermentable sugar, in many respects very similar to grape-sugar, and to which some chemists have given the name of *lactose*, a term commonly applied to milk-sugar itself. On treating a moderately diluted acid solution of milk-sugar with yeast, this variety is first formed, and then yields carbonic acid and alcohol; if, however, decomposing matters, as, for example, casein in the act of disintegration, are present, it undergoes lactic and butyric fermentation; and hence we understand how milk after exposure for a time to the air becomes sour. The intoxicating character of the drink prepared by the Kalnucks and Tartars from sour mares' milk, is due to this indirect vinous fermentation of sugar of milk. Regarding the uses of this variety of sugar, it may be observed that it is probably the most important of the constituents of whey (which is milk deprived of the whole of its casein except a mere trace held in solution), and hence that it is the active ingredient in the *whey-cure*, which is so popular in Switzerland. (The whey in these cases is usually obtained from goats' milk.) It is also the chief constituent of the globules used in homeopathy.

The second group of sugars, namely, those which are incapable either directly or indirectly of undergoing fermentation, are of less practical importance than cane sugar, grape-sugar, or milk-sugar.

Inosin, or *inosite* (derived from the Greek *is*, gen. *inos*, muscle), is represented by the

formula $C_{12}H_{12}O_{12} + 4Aq$. It occurs as a normal constituent in the juice of the heart, and of the involuntary or unstriped muscles, and has also been found in the tissues of the lungs, spleen, liver, kidneys, and brain, and in the urine in Bright's disease and diabetes. It has been recently shown that it is identical with the substance previously known as *phasco-mannite*, which is readily obtained from the unripe seeds of the common kidney-bean (*phaseolus vulgaris*). It forms colorless efflorescent prisms, which lose four equivalents of water at about 210° . When mixed with decaying cheese and chalk, it becomes gradually converted into lactic and butyric acids. *Seyllite* is a saccharine matter closely resembling inosite, and occurring in various organs of several plagiostomous fishes, and especially in the kidneys of the rays and skate. It differs, however, from inosite in its crystalline form, and in its containing no water of crystallization. Its composition is unknown. *Sorbin*, or *sorbite* ($C_{12}H_{12}O_{12}$), derives its name from its occurring in the juice of the berries of *sorbus aucuparia*, the service tree, and may be obtained in colorless transparent rhombic octahedra. It reduces oxide of copper to the suboxide (Fronmmer's test), and is of a sweetish taste.

Closely allied to the sugars, but differing from them in their chemical composition (inasmuch as they do not contain hydrogen and oxygen in the proportions to form water), are *mannite* ($C_{12}H_{14}O_{12}$), obtained from *mannu*, the inspissated juice of the *fraxinus ornus*, but also occurring in celery, onions, asparagus shoots, *laminaria saccharata* and other sea-weeds, certain fungi, the juice which exudes from apple and pear trees; *dulcite* ($C_{12}H_{14}O_{12}$), the product of an unknown Madagascar tree; *quercite* ($C_{12}H_{12}O_{10}$), obtained from acorus; and *pinite* ($C_{12}H_{12}O_{10}$), from *pinus lambertiana*, a tree growing in Australia and California. All these bodies are crystalline, and sweet to the taste.

Although chemists have hitherto looked upon the sugars as organic compounds, without any recognizable radical, and from their composition have termed them *carbohydrates*, "the researches of Berthelot render it probable that the sugars as well as mannite, and the bodies allied to it, are polyatomic alcohols, like glycerine, for he has found that they possess the power of entering into combination with various acids, with elimination of water, in some cases yielding colligated acids analogous to the tannic, and in others furnishing neutral bodies, closely allied to the fats." Miller's *Organic Chemistry*, 2d ed. p. 72.

Among the various chemical purposes to which the phenomenon of circular polarization may be applied, we may especially mention its use in determining the quantity of any kind of sugar in solution. While some sugars give a right-handed rotation, others give a left-handed rotation, and each sugar exerts a definite amount of rotatory power. The following are the rotatory powers of the chief varieties of sugar, equal weights of each being dissolved in an equal bulk of water, and the temperature being 56° :

Cane-sugar	($C_{12}H_{11}O_{11}$)	right	$73^{\circ}8$
Trehalose	($C_{12}H_{11}O_{11}$)	"	220°
Melczitose	($C_{12}H_{11}O_{11}$)	"	$94^{\circ}1$
Mycose	($C_{12}H_{11}O_{11}$)	"	193°
Inverted sugar	($C_{12}H_{12}O_{12}$)	left	28°
Grape-sugar	($C_{12}H_{12}O_{12}$)	right	$57^{\circ}4$
Milk-sugar	($C_{12}H_{12}O_{12}$)	"	$56^{\circ}4$
Sorbin	($C_{12}H_{12}O_{12}$)	left	$46^{\circ}9$

For details regarding the apparatus to be employed, and the method of using it, we may refer to Miller's *Chemical Physics*, 3d ed. p. 204; and to a memoir by Clerget in the *Ann. de Chimie*, iii., xxvi. 175. This method has been applied to determine the amount of sugar in diabetic urine, to ascertain the quantity of sugar which remains in the unfermented state in wines, and to other similar purposes. As, however, the process is one of extreme delicacy, this method must be used with great caution.

Manufacture.—The manufacture of sugar from the sugar-cane and other sources is now one of the largest branches of human industry, but this great development is of comparatively recent date; and although there are evidences of its very high antiquity in India and China, sugar appears only to have been vaguely known to the Greeks and Romans. It is mentioned by Theophrastus as "honey in reeds;" and Lucan has the following line, which indicates a knowledge of its existence, but merely as a curious fact:

Quique bibunt tenera dulces ab arundine succos.

Its introduction to Europe appears to have been one of the results of the Crusades. The sugar-cane was grown in Cyprus about the middle of the 12th c.; it was from thence, at a later time, transplanted to Madeira, and at the commencement of the 16th c., was carried from the latter island to the West Indies. Originally, in all probability, only the sweet recent juice was known; for apparently the art of boiling it down, and forming it into raw sugar, was an invention of the 15th c.; and it was not until the middle of the following century that a Venetian discovered the art of refining sugar, which soon became established in Germany. The first refinery of which any notice exists was one in Dresden, as early as 1597; but long previous to this the subject had attracted so much attention as to be discussed in learned treatises, one of which in particular, the *Saccharologia* of Sala, in the beginning of the 16th c., shows that the clarification of the syrup by defecation was then a matter of some importance. Still, the manufacture of sugar in the

countries to which it had been introduced made but slow progress, for its use was limited by its dearness to the wealthy. The material has now, however, become one of the commonest necessities of life, and has largely conduced to the health of nations. Until 1747, sugar was supposed to be the product of the sugar-cane only, but in that year, Marggraf, a German chemist, demonstrated that it was a natural product of other vegetables, and especially of the beet-root; and half a century later, its manufacture from that source was first commenced in Silesia. A large portion of the sugar consumed on the continent is now obtained from this source. See BEET-ROOT SUGAR.

Since we have become better acquainted with the sources of our own supplies, we have learned that a large portion of the raw sugar of the East Indies received in British ports as cane-sugar is in reality made from the juice of several palms, especially that of *arenga saccharifera*, and the wild date, *phoenix sylvestris*. The juice is obtained from these plants by cutting off the male spadix when young, and from the cut portion there is for four or five months a continual flow. The liquid is at first clear, and is immediately boiled down to a thick sirup, which granulates on cooling, and constitutes, if not otherwise purified, the coarse brown sugar called jaggery, which is extensively consumed in India. More carefully prepared, it is sent to Europe with sugar made in the cane-plantations, and is only distinguished from it by well-skilled persons. If the juice is not immediately boiled, it becomes turbid, and passing into the vinous fermentation, forms the intoxicating drink called toddy.

In Canada and in the United States very much sugar is made by boiling the juice or sap of the sugar maple-tree (*acer saccharinum*). The *sorghum saccharatum*, or sugar-grass (see DURRA), and the stalks of ordinary maize or Indian corn (*zea*) yield sugar, which has lately been made so as fairly to rival the best crystallized cane-sugar (see under SUGAR-CANE).

Beet-root sugar is manufactured from the fresh-dug roots, chiefly of the varieties we call mangold-wurzel. The process (which, however, is constantly undergoing modifications) is briefly described in the article BEET-ROOT SUGAR. Beet-root yields from 7 to 8 per cent of sugar, of which only 3 to 4 per cent are of the best quality, called *melis*, 2 to 3 per cent of the second quality, called *farin*, and the remainder molasses.

The manufacture of starch-sugar is described in the article GLUCOSE.

From the beginning of the 16th c., when the sugar-cane of India was introduced to the West Indies, sugar has been one of the most important products of those islands. Careful cultivation has produced many varieties of this useful plant, some of which are better adapted than others for particular localities. The original variety introduced into the West Indies is still cultivated under the name of the *Croole cane*; but the favorite variety is the *Otaheite cane*, which is the most luxuriant grower, and gives the largest yield of juice. It is the variety chiefly cultivated in Brazil, Demerara, and Venezuela, as well as the West Indies. In many parts of the east, another admirable variety is the *Babian or striped cane*; it was originally raised in Java, and is the favorite with rum-distillers.

The extraction of juice from the sugar-cane is effected by simple pressure. In its native country, India, there are still in use in some districts machines of the rudest construction, which are probably the same which were used a thousand years since. The Chinapatam sugar-mill consists of a mortar made by cutting down some hard-wood tree to within 2 or 3 ft. of the ground, and hollowing the top of the portion left standing in the ground into the form of a mortar. A small hole is then bored obliquely through from the bottom of the cavity to the outside, and a pipe conveys the juice into a jar. A cylindrical piece of wood, sharpened at each end, acts as a pestle, and is kept in its place with sufficient pressure by a lever and ropes. Two men are required: one has a basket supplied with small lengths of freshly-cut cane, which he places, 2 or 3 at a time, in the mortar, and, when necessary, removes the crushed ones; the other man sits on the other end of the train, balancing it, and at the same time drives oxen which are attached to the end of the beam, and keeps the movable parts of the mill constantly turning round. Notwithstanding the rudeness of this contrivance, very large quantities of sugar are made by it in India. A much better one, however, is the Chica Ballapura engine, which consists of two upright rollers, the heads of which are formed into double spiral screws, which work in one another, so that when an ox is yoked to the long curved lever and goes round, one of the upright rollers, being connected with the lever, is made to revolve, and its screw carries the other one round, but in an opposite direction. The pieces of cane are fed in by hand between the rollers, and as the juice is squeezed out, it flows down into a small hollow below the frame made to receive it, whence a small trough carries it to an earthen pot. The frame of this mill is securely fixed with stakes driven deep into the ground. In all probability, this very ancient machine has been the origin of all the most modern ones, for they all consist of rollers placed either vertically or horizontally, between which the canes are made to pass.

The mills now in general use for squeezing the juice out of the sugar-canes are very powerful machines. Some idea of the strength of those mills will be formed from the fact, that one of the rollers weighs upward of 5 tons. The axles are 12 in. in diameter, and notwithstanding that they are made of the best wrought iron, they are not secure against breakage. The manufacture of sugar has probably been carried to greater perfection in the islands of Java, Mauritius, and Cuba, than in any other parts

of the world. In Java especially, in consequence of the great extent of the plantations, the planters have been able to erect very complete establishments for the manufacture of sugar.

The following very condensed account of the process of making sugar in Java will give some idea of the operation.

The canes, freed from all loose leaves, are passed through between the rollers under the greatest possible pressure that can be brought to bear upon them. The rollers revolve only from two to four times per minute. From 100 lbs. of canes, 65 to 75 lbs. of cane-juice will be expressed. This juice, which is of a sweetish taste, and of the color of dirty water, passes direct from the mill to a small reservoir, where it usually receives a small dose of quicklime, and without delay runs off to large iron or copper vessels, heated either by a fire underneath or by steam-pipes in the liquid. As the temperature of the juice rises, a thick scum comes to the top, which is either removed by skimming, or the warm juice is drawn off from below the scum. The concentration of the juice is partly effected in a series of large open hemispherical iron pans about six to eight ft. diameter, of which five or six are placed in a row, with a large fire under the one at the end. This one fire, which runs along under the whole row of pans, is found sufficient to make two or three of them nearest the fire boil violently, and in addition, it warms the juice in the pans furthest from the fire. As the juice first enters the pans furthest from the fire, it gets gradually heated, and the vegetable impurities rise in scum to the top, and are carefully removed. As the juice is ladled from one pan to the next, it boils with greater and greater vigor as it approaches nearer the fire, until in the pan immediately over the fire it seethes and foams with excessive violence; and this seems to be essential to the successful making of sugar. It is known that the presence of all those impurities which constitute the scum interferes with the crystallizing of the sugar; and the rapid ascent of bubbles of steam through the liquid in the pans carries all impurities dispersed through the body of the liquid to the top, where they can be removed with facility. It is well known that great heat is very destructive to cane-juice; that is to say, it turns much of the crystallizable sugar into treacle or uncrystallizable sugar, but the gain arising from getting rid of much of the impurity in the cane-juice more than compensates for the destruction of part of the sugar. After the concentration has been carried to a given point, and all the scum has been got rid of, the application of a high heat, which would act with an increasingly destructive effect as the condensation became greater, is suspended, and the liquor, now of the color of turbid port wine, and of the consistency of oil, is drawn into the vacuum-pan, where the concentration is completed at the lowest possible temperature, generally about 150° Fahr. The vacuum pan is in universal use in all European sugar-refineries, and in all well-provided sugar-plantations. It is generally made of copper, of a spherical form, and from six to nine feet diameter. The bottom is double, leaving a space of an inch or two for the admission of steam between the two bottoms, and there is generally a long coiled copper pipe of three or four inches diameter above the inner bottom, so as to still further increase the amount of heating surface. This apparatus is made perfectly air and steam tight. Leading from its upper dome, there is a large pipe, communicating with a condenser into which a rush of cold water is continually passing, so as to condense all the steam or vapor that arises from the liquid boiling in the vacuum-pan. The water which is constantly rushing into the condenser is as steadily withdrawn again by pump. There is thus a constant vacuum in the pan, and, consequently, the liquid in it will boil at a much lower temperature than it would in an open pan or boiler. There is an extraordinary advantage in being able to effect the latter stages of concentration at a low temperature, for it is when the liquid becomes thick that the destructive results of a high temperature become most excessive.

As the concentration of the liquid in the vacuum-pan proceeds, crystals of sugar begin to form, and the skill of the sugar-boiler is shown by the uniformity of the crystals he produces. The boiling is commenced by filling in only about a third or fourth of the quantity the vacuum-pan will hold, and gradually adding more liquid as the crystals increase in size. The sugar-boiler is able to watch the changes going on in the vacuum-pan by means of small samples he withdraws from it by means of a suitable apparatus. The sugar-boiler holds those drops of thick fluid on his finger and thumb, between his eye and a strong light, and is thus able to detect those minute changes in its condition which show that it is time to add an additional quantity. By the time the vacuum pan is full, the contents have thickened, by the formation of crystals of sugar, into a mass of the consistency of thick gruel; it is then allowed to descend into a vessel called the heater, where it is simply kept warm until it can be run out into the "forms," which, in the sugar-growing colonies, are generally conical earthen pots, holding from one to two cwt. of sugar. It is allowed to cool and complete its crystallization before the plugs, which close the bottom of the pots, are withdrawn. When this is done, from one-fourth to one-third of the contents of the forms, which has remained in a fluid state, runs off into gutters leading to large tanks, from which it is again pumped up into the vacuum-pan, and reboiled, yielding a second quality of sugar. This reboiling of the drainings is repeated, with a continually decreasing result, both as to quantity and quality of the solid sugar obtained, and it is rarely carried beyond the fourth boiling. If the planter wishes to obtain Muscovada or unclayed sugar, the process is now complete, and the sugar is turned out of the forms, and packed for shipment. In some cases, the sugar is

run direct from the vacuum-pan into casks or hogsheads, which replace the forms, holes being bored in the bottoms of the casks, to admit of the uncrystallized portion of the sugar draining out.

If *clayed* sugar is to be made, the forms are allowed to stand for a few days until all the treacle has drained out; and a quantity of thin mud, about the consistency of good thick cream, is then poured over the sugar to the depth of one or two inches. The water contained in this thin mud slowly steals down through the sugar, and mixing with the coatings of treacle still adhering to the outsides of the crystals of sugar, renders them less viscid, and facilitates their descent to the bottom of the form. The mud remains, at the end of a few days, in the form of a dry hard cake on the top of the sugar, and none mixes with the sugar.

The process of claying sugar is simply washing off a coating of black or yellow treacle from a crystal of sugar, which is always white. This operation is possible without dissolving the crystal of sugar, simply because the treacle has a greater affinity for water than the crystallized sugar has. Anything that would yield a very slow and steady supply of water to the sugar, would do as well as mud or clay. There is always some loss of crystallized sugar in the process of claying, and attempts have been made to use strong alcohol for washing off the coatings of treacle from the crystals; but although alcohol dissolves treacle very freely, and scarcely acts on the crystals at all, still it has not been found to answer commercially. Besides the cost of the process, there is a difficulty in getting rid of the smell of alcohol in the sugar.

The centrifugal machine of Messrs. Manlove, Alliott & Co. has been very extensively used for getting rid of the treacle. Its action depends on precisely the same principle as that called into play when a sailor twirls a mop to expel the water from it. The centrifugal machine is simply a drum of 3 or 4 feet diameter, and 12 to 18 inches high, revolving at a great velocity on a vertical axis. The sugar, either direct from the vacuum-pan or after it has been allowed to cool, is put, still mixed with the treacle, into the machine. As soon as the drum acquires a high velocity its contents are forced by the centrifugal action against the drum, the cylindrical portion of which is made like a sieve, and admits of the escape of the treacle, but retains the crystals of sugar. Some idea of the efficiency of those machines may be formed when it is stated, that in a machine of 3 ft. diameter, revolving at the usual speed of 1000 revolutions per minute, the tendency of the treacle to escape will be 514 times its own weight; that is to say, the treacle will have 514 times more force to fly off than it has to drop off the crystal by the mere force of gravity.

Sugar-refining was unknown to the ancients, and even the refining previously referred to as having been established in Germany in the 16th c. consisted merely in clarifying the sirup, and producing a sort of sugar-candy; but one improvement followed another, until the process may now be considered as almost perfect. The chief difficulties attending the operation arise from the circumstance that the material to be operated upon is ever varying in quality. Not only is there a difference between the produce of two different plantations, but even the manufacture of the same plantation shows differences of quality; these differences arising chiefly from the presence of foreign substances, which seriously interfere with the operations of the refiner. The attempts made to test the exact quality of solutions of raw sugar by means of polarized light (see above) have hitherto been attended with little success in practice. Sugar-refining, as practiced in Britain, has three distinct objects—(1) the production of loaves of thoroughly refined sugar; (2) crushed sugar; and (3) white sugar in separate crystals. The last is of comparatively recent introduction. In some existing sugar-refineries, old fashions still prevail; but our description must be confined to the most recent methods.

Sugar refining is carried on in this country on a great scale; London, Bristol, and Greenock being the principal seats of the trade. There is comparatively little raw sugar used in Great Britain. Nearly all the yellow and dark-colored sugar sold in the shops has passed through the hands of the refiners, and is simply inferior sugar, made out of the sirup which drains from the white loaf-sugar.

Sugar-refineries are built eight or nine stories high, and the raw sugar is first hoisted to the upper story, where it is dissolved in large tanks of hot water, care being taken to use as little water as possible for the purpose. A quantity of bull's blood is stirred into the solution of sugar, and the heat being gradually raised, the albumen of the blood coagulates, and rises to the surface in the form of a thick light scum, bringing with it nearly all the mechanical impurities floating in the fluid. The liquor, still hot, is then passed into bag filters. These filters are made of a very closely woven cotton cloth, capable of retaining the minutest mechanical impurity. In order to facilitate the passage of the liquor through the bags, they are suspended in a kind of iron closet, and surrounded by an atmosphere of steam to keep the liquor hot. From the bag-filters the liquor, now freed from all mechanical impurities, but of a dark color, flows into a lofty cylindrical iron filter, of about 5 or 6 ft. diameter, and 20 or 30 ft. high, filled with animal charcoal, that is, charcoal made of bones. This charcoal is reduced to coarse powder; and the dark offensive liquor is allowed to percolate very slowly through the mass. The result is, that it flows out at the bottom a perfectly transparent and pure solution of sugar. The charcoal can only be used for a few days at a time, because it gradually loses its purifying power; when the liquor begins to flow through it without

being purified, it is taken out of the filter, and reburned, which completely revives its powers.

The liquor as it flows from the charcoal filter is a mixture of pure sugar and pure water, and perfectly transparent. The application of heat is the only mode of expelling the water, and this unfortunately blackens the sugar again. In order to get rid of the water with as little heat as possible, the colorless liquor is boiled in the vacuum-pan as in the early process of the manufacture. The liquor boils in vacuo at about 150° F., and even this moderate heat has the effect of turning it quite brown. When it has been sufficiently concentrated by boiling in the vacuum-pan, which takes from 1½ to 2½ hours, it is run into the sugar-loaf forms; which, after cooling, are carried to a room kept warm by means of steam-pipes. This warmth facilitates the flow of the treacle or syrup out at the aperture at the bottom of the form. To get rid of the coating of colored treacle which still hangs about the crystals of sugar, a small quantity of a saturated solution of pure white sugar is poured on the top of the form. This strong liquor is unable to dissolve any more sugar, but being more fluid than the sticky coatings of treacle or syrup adhering to the crystals, it mixes with the coatings, and makes them fluid enough to flow down to the bottom of the form, leaving the crystals clear of syrup or treacle, and consequently free of all color. This process of washing off the coloring matter from the crystals of sugar is the same in principle as the "claying" used in the production of sugar. The loaves of sugar, after standing some time, to admit of all the liquor draining off, are wrapped in paper, and dried in stoves heated by steam. The liquor draining from the forms is reboiled in the vacuum-pan, and forms loaves of an inferior quality; and the liquor draining from the inferior loaves is again boiled into the yellow sugars known among sugar-refiners as bastards.

Crushed or crashed sugar is simply inferior loaves crushed while still soft and moist, and packed in hogsheads, instead of being left in the loaf form.

The syrup which drains from refined sugar is reboiled, and constitutes the *golden syrup* of the shops.

Crystal Sugar.—In making the sugar crystals, all the processes are carried on as in refining, until the syrup is clarified. Then it is boiled or concentrated in a vacuum-pan of larger size than ordinary, and the concentration is carried on until minute crystals appear. Fresh syrup is then added from time to time, great care and experience being required to insure a regular feeding of the first-formed crystals, and prevent the formation of a second crop. When the crystals are large enough, the contents of the pan are transferred to the centrifugal machines, which quickly separate the crystals in a perfectly dry state from the uncrystallizable syrup. The crystals are of a square tabular form, with a deep groove across in one direction, dividing the crystal into equal parts. This kind of sugar is much liked for coffee, etc., but the crystals dissolve with difficulty.

The commerce in sugar is prodigious, and is rapidly increasing; but its consumption is very unequally distributed. Thus, in the six principal countries, America consumes the most, and Russia and Austria least. The proportions are as follow: Great Britain, 30 lbs. per head; France, 4 lbs.; Belgium, 6 lbs.; Russia, 1½ lbs.; Austria, 1½ lbs.; United States of America, 40 lbs. The quantity of all kinds imported into Great Britain in 1877 amounted to the enormous sum of 831,047 tons unrefined; 171,492 tons refined; and 14,913 tons of molasses; the total value of all of which was £27,327,988.

SUGAR-CANE, *Saccharum*, a genus of grasses, natives of tropical and sub-tropical countries. The common sugar-cane (*S. officinarum*) is originally a native of the East Indies, was brought to the s. of Europe by the crusaders, and in the 15th and 16th c. found its way into all the European colonies within the tropics. In Europe the cultivation of the sugar-cane has always been very limited, and is scarcely practiced except in Sicily and Andalusia. In China it extends to 30° n. lat., and in North America to 32°; in the southern hemisphere only to 22° s. lat. The plant is a perennial with a creeping root, sending up a number of culms or stems, generally 8 to 12 ft. high, which have many joints, are of various colors, and about 1 to 2 in. thick. They are filled for about two-thirds of their length with a loose, sweet, juicy pith. The leaves are ribbon-shaped, and 4 to 5 ft. long, with a strong whitish middle nerve. The flowers are in great diffuse pyramidal panicles of a yard in length. The violet-colored sugar-cane (*S. violaceum*) is particularly esteemed, and much cultivated in the West Indies.—The Chinese sugar-cane (*S. sinense*), cultivated in China, has the stem in great part covered with the sheaths of the leaves. Cultivation has produced many varieties of these species; if, indeed they are originally distinct species, and not themselves mere varieties.—The species of *saccharum* are numerous; they contain much silica in the rind, and some of them are much employed in India for thatching and for making mats, as well as for screens and light fences. The Bengalese make their pens of the hollow stems of *S. semidecumbens* and *S. fuscum*.

The sugar-cane is usually propagated by cuttings. For this purpose the top joints are used. The cuttings are planted in rows 3 or 4 ft. apart, and at intervals of about 2 ft. in the rows. The largest varieties, in rich moist soils, attain a height of 20 ft.; but in dry poor soils, the height is sometimes scarcely more than 6 feet. The plant *tillers* like wheat, but not to the same degree. The cane-ground is kept clean by hand-hoeing, or by the plow. Hand-hoeing was formerly universal in the West Indies, but the plow

is now very generally used where the nature of the ground permits. The best varieties are ready for cutting in about ten months from the time of planting, but other varieties require a longer period of growth, from 12 to 20 months. When the canes are fully ripe they are cut a little above the ground, and tied in bundles to be conveyed to the mill. Fresh canes called *rattoons* spring from the root, so that the plantation does not require to be renewed for several years; but the canes of the first crop are the largest, and a gradual decrease of size takes place. The ordinary practice on sugar estates is to renew a part of the plantation every year.

The name CHINESE SUGAR-CANE is sometimes given to the SHALOO or SUGAR-GRASS (*sorghum saccharatum*), already noticed in the article DURRA. A still more important sugar-yielding grass is the ordinary maize or Indian corn. The sorghum became known in America in 1857, and has latterly been extensively cultivated for producing syrup. It has long been known that sugar could also be obtained from the stalks of maize; but neither sorghum sugar nor maize sugar could till lately be made so as to compete commercially with the produce of the sugar-cane. Recently, however, an American gentleman—Mr. Stewart, of Murraysville, in Pennsylvania—has discovered a method of obtaining from both sorghum and maize crystallized sugar equal to the best kinds known. The processes are somewhat simpler than those in use for the sugar cane, and are more economical than those employed in making beet-sugar. The quantity is also abundant. It has been calculated that, on an average, one acre of maize may yield 1800 lbs. of sugar and 44 galls. of molasses; and that the yield of sugar from one acre of maize will give as good a profit as could be got from 30 acres of wheat. (See report of Mr. Drummond, British secretary of legation at Washington in 1878.) Two per cent of the area now given to maize would serve to supply the enormous demand for imported sugar in the United States. It is therefore easy to see how great would be the effect produced in the sugar trade of the world if the United States were to utilize for their own use, as they may now easily do, their own sugar supplies; still more if they should become a sugar-exporting country.

SUGAR-OF-LEAD, the common name for acetate of lead. See LEAD.

SUHL, a t. of Prussia, province of Saxony, and government of Erfurt, is situated on a small stream, called the Lauter, in a romantic valley on the s.w. side of the Thuringian forest, 33 m. s.s.w. of Erfurt. The name Suhl, which in the Sorb-Wendish dialect means salt, is probably derived from the salt springs, formerly much worked. Mining is extensively carried on in the neighborhood, and has been so for centuries. The principal manufactures are iron and steel wares, chemical preparations, paper, and leather. Suhl, celebrated in the days of chivalry as the "arsenal of Germany," still maintains its ancient reputation as a manufactory of arms. Pop. '75, 10,721. Its history is very interesting; see Werther's *Sieben Bücher der Chronik der Stadt Suhl* (1847).

SUHM, PETER FRIDERIK, a Danish historian, was b. in Copenhagen, Oct. 18, 1728, of an ancient and noble family, and was sent to the university of Copenhagen, where he graduated in law in 1748. A few years later he went to Norway for the sake of prosecuting his studies in philology and history, in conjunction with the learned historian Schöningh, and did not return till 1765 to Copenhagen, where he continued to reside till his death in 1798. Among his numerous works on the early mythical and political history of Denmark we may instance the following: *Forsøeg til Forbedringer i den gamle danske og norske Historie* (1757); *Om de nordiske Folks ældste Oprindelse* (1770); *Om Odin og den hedenske Gudelære* (1771); *Critisk Historie af Danmark i den hendske Tid*, i.-iv. Band (1774-81); *Historie af Danmark*, 1ste Tome (1782). Besides numerous other historical essays, moral treatises, poetic compositions, contributions to the philosophical and literary periodicals of Germany, France, and Denmark, etc., he edited *Scriptores Rerum Danicarum Mediæ Ævi*, from vol. iv. to vol. vii. inclusive (Hafniæ, 1776-92) and took upon himself the cost and supervision of the publication of many remains of old northern literature. Suhm was an indefatigable collector of rare and curious books; and in 1796, in return for a pension from the government, he made over to the royal library of Copenhagen his valuable library of 100,000 volumes, to which he had previously allowed the public access. After the death of his only son he devoted the greater part of his ample means to the purpose of having copies made of the more valuable MSS. in the collection, many of which were, moreover, printed at his sole charge; besides which he founded scholarships and afforded direct pecuniary assistance to many poor students and learned men. He died in 1798. Suhm's collective writings were brought out by S. Poulsen, in 16 vols., between 1788-99; and various editions of his lesser works have at different times appeared in Germany, as well as in Denmark, where he is justly regarded as one of the most learned and laborious and patriotic writers of his country.

SUICIDE (Lat. self-murder) is a heinous crime, by the law of the United Kingdom, though it was treated as venial by the Roman law, and was the subject of panegyric by Stoic philosophers. The law of England treats it as a felony, and hence there may be accessories to it, so that if A persuade B to kill himself, and B does so, A is guilty of murder. Suicide, or *felo de se* (q.v.), not only includes one who deliberately kills himself, but also one who in maliciously attempting to kill another is himself killed. If A, however, requests B to kill him, and B does so, A is not a *felo de se*, though B is a murderer. If A and B mutually agree to commit suicide together, and in the attempt one

only dies, the other is guilty of murder. When it is said that a man was a suicide, this implies that he was in his senses, for otherwise he committed no crime; hence an insane person, unless when in a lucid interval, cannot commit the crime. The punishment inflicted on a suicide consisted, formerly, in an ignominious burial in the highway, with a stake driven through the body, and without Christian rites, also the legal consequence was forfeiture of the goods and chattels to the crown. The only consequences now are forfeiture of goods and deprivation of Christian rites. The burial now takes place in a churchyard, but between 9 and 12 P.M. An attempt to commit suicide is not punishable like an attempt to murder a third party, nevertheless it is a misdemeanor. The consequences of suicide on the contract of life-assurance are generally guarded against by an express stipulation that, if the assured die by his own hand, the policy shall be void; and it has been held by the courts that the policy is forfeited even though the party destroyed himself in a fit of frenzy or delirium.—In Scotland suicide is also followed by forfeiture of the movable estate to the crown.

There are, no doubt, even in modern times, some who hold the theoretical opinion that suicide is permissible in certain circumstances, but in regard to those who have actually permitted or attempted the crime, there has almost always been detectable evidence of cerebral changes, or, at all events, of that irritation and excitement which initiate and accompany molecular disorganization of the nervous structure. In short, suicide, as a rule, is a symptom of some form of insanity, permanent or temporary, in which the emotions and passions are excited or perverted. Suicide is likewise a concomitant of certain bodily diseases; for example, of dilatation and fatty degeneration of the heart, of blood degeneration, of affections of the intestinal mucous membrane, of the uterus, and of the brain and nervous matter; and it may be regarded as a frequent sequence of the melancholic, the morose, and hypochondriacal temperament. It has appeared as an epidemic; it has been observed as a hereditary tendency in certain families, and as a tendency more frequently exhibited by males than females; more frequently by the educated and affluent than by the industrial and ignorant classes; most frequently in large cities, and as directly engendered by luxury, political agitation, gambling, intemperance, and demoralization. It would appear, however, that indulgence and asceticism, riches and extreme poverty, claim nearly an equal number of victims. It has been calculated that twice as many artisans commit suicide as laborers. In 1840, it was found that in every 10,000 of the population, 1.33 masons, carpenters, butchers; 7.43 tailors, shoemakers, bakers; 4.9 bankers, professionals; 2.0 of persons assured in equitable office; 7.8 dragoons; 6.7 servants and coachmen; 4.0 paupers, died by their own hand. Observation has shown that from 20 to 35 is the most influential age in inducing the suicidal tendency, and the age appears to determine, to a certain degree, the modes of death selected as well as the proclivity. As might be expected, the nature of the delusion, the accessibility of the means, imitation, the profession or pursuit of the individual, novelty, and notoriety, all influence the choice of the instrument or means of death. The theomaniac dies by crucifixion; the great majority by ropes, rivers, wells, razors, arsenic; the medical man by aconite, chloroform. Even sex is characterized by peculiar preferences. Females seek voluntary death according to the following order of the means—hanging or strangulation, abstinence, precipitation, drowning, cutting, poison; males, again, according to this order—cutting, shooting, hanging, poison, drowning. Race, climate, country, and the distinguishing polity of different societies to a certain extent affect the proportion of suicides to the population. In the kingdom of Sweden there is calculated to be 1 suicide to every 92,375 inhabitants; in Saxony, 1 to 8,446; in Russia, 1 to 34,246; in the United States, 1 to 15,000. In Paris, 1 suicide occurs in 2,700; in St. Petersburg and London, 1 in 21,000 citizens. Middlesex, again, is the most prolific of all English counties; Chester least so; there being in the former 10.5, in the latter 7.2 to 100,000 people. In all England, the proportion is 7.4.—*Anatomy of Suicide*, Forbes Winslow; *Du Suicide et de la Folie Suicide*, etc., a Brière de Boismont; *Traité du Suicide*, Louis Bertrand; *English Suicide Fields*, Radcliffe, p. 701; *Medical Critic*, 1862.

SUIDÆ, a family of mammalia, of the order *Pachydermata*, having the feet generally four-toed, the hinder feet some times three-toed; the toes hoofed, the two front toes forming the principal part of the foot, the others smaller and scarcely touching the ground; the snout abruptly truncated, mobile, muscular, and sensitive, but not elongated into a proboscis; the tail short, or almost wanting; the incisor teeth variable in number, the lower ones all directed forward, the canines projecting, and bent upward; the stomach little divided. To this family belong hogs, wart-hogs, peccaries, etc.

SUIDAS, the name given by the compiler of a *Lexicon* some time during the Byzantine empire. When helioid, or who he was, or whether he was even called Suidas, no one can say, but it is customary to place him about the 10th or 11th century. The *Lexicon* bears unmistakable evidence of having gone through many hands; and though we can fix the date when several of the articles *must* have been written, it is impossible to ascertain whether they are the compositions of the first compiler or of a later editor. The work is a sort of cyclopedia, giving an explanation of words, and notices of persons, places, etc., in alphabetical order. It is utterly destitute of literary or critical merit, but is valuable in the eyes of scholars on account of its numerous extracts from ancient Greek writer, grammarians, scholiasts, and lexicographers, whose writings in many

cases have perished. The first edition appeared at Milan (1499): since then the best editions have been those of Küster (Camb. 3 vols. 1705), Gaisford (Oxf. 3 vols. 1824) Bernhardy (Halle, 2 vols. 1834), and J. Bekker (Berl. 1854).

SUI JURIS, in the Roman law, the condition of a person not subject to the *Patria Potestas* (q.v.). The paterfamilias was the only member of a family who was *sui juris*, all the rest being *alieni juris*, including sons, unmarried daughters, the wife, and the wives and children of the sons of the paterfamilias. A daughter, on her marriage, passed into the family of her husband, but a son did not become *sui juris* by marriage. A son or unmarried daughter became *sui juris* on the death of the paterfamilias. In his father's lifetime a son could only become *sui juris* by emancipation. The laws of the twelve tables declare that a son three times sold by his father should be freed from his power; and the ceremony of emancipation was of the nature of a fictitious sale gone through three times, in order to liberate the son from parental control. *Connubium* being the foundation of the *patria potestas*, a bastard was *sui juris*.

SUIR, a river of Ireland rising in the n. of the county of Tipperary, flows s. through that county by the towns of Thurles and Cahir; 10 m. s. of Cahir it bends eastward, forming the boundary of Tipperary and Waterford, and passing by Clonmel and Carrick. It then passes out of Tipperary, and meeting the Barrow at Passage, Waterford, falls into the sea in Waterford Haven, after a course of about 100 m. It is navigable by barges as far as Clonmel.

SUIT IN CHANCERY was the process corresponding to an action in a court of law. The suit generally commenced with a bill, i.e., a petition to the lord chancellor, which set forth the grievance, with a prayer for redress. It was signed by counsel, and was served on the defendants, either personally or at the dwelling-place. They had then to enter appearance, and put in either an answer or a demurrer, or a plea, which were the several defenses to the suit, according to the nature of the subject matter. Since 1876, all suits have been called actions, but the procedure is not much changed. An appeal lies from the chancery division of the high court to the court of appeal, and finally to the house of lords.

SUL, RIO GRANDE DO. See RIO GRANDE DO SUL.

SULIMAN' MOUNTAINS, a mountain range upward of 350 miles in length, running from n. to s., and forming the boundary between Afghanistan and the Punjab. In lat. about 33° 20', it throws off the lateral branch of the Salt Range (q.v.). The highest summit of the range is Tacht-i-Suliman (Solomon's throne), 11,000 ft. high, and covered with snow for three months of each year.

SULINA, one of the lower branches of the Danube (q.v.), flows through the middle region of the delta of the great river, and enters the sea at about the same distance from the Kilia mouth on the n. and St. George's mouth on the south. It is the smallest outlet of the Danube, and conveys only $\frac{3}{8}$ of the main river to the sea; but its channel through the bar that lines the coast is deeper than that of the other mouths, and therefore the Sulina is more frequented by vessels than any other branch of the Danube.

SULIOTS, a tribe who inhabited the valley of the Acheron, in the pashalik of Janina (*Epirus*) in European Turkey, are a mixed race, being partly of Hellenic and partly of Albanian origin. They are the descendants of a number of families who fled from their Turkish oppressors to the mountains of Suli (whence they derive their name) during the 17th century. In this obscure corner of the Turkish empire they prospered; and toward the close of the 18th c., numbered 560 families, inhabiting 90 hamlets. For about 51 years they heroically resisted the encroachments of Ali Pasha (q.v.) of Janina upon their independence, the very women taking part in the strife. Vanquished in 1803, they retreated to Parga, and afterward to the Ionian islands, where they remained till 1820, when their old oppressor, Ali Pasha, finding himself hard pressed by the Turks, invoked their aid, offering them guarantees for his faith, and his grandson as a hostage. Eager to return to their cherished home, they accepted these terms, and under Marcos Bozzaris (q.v.), maintained a long and desperate conflict with the Turks, but were ultimately forced again to flee from their country, and take refuge to the number of 3,000 in Cephalonia, though a large remnant preferred to skulk in the neighboring mountains. Though they took a glorious part in the war of Greek independence, their country was not included by the treaty of 1829 within the Greek boundary-line; but most of them established themselves in Greece, where their leaders were raised to important offices. The old seat of the Suliots lies in a portion of Epirus which the Berlin congress of 1878 recommended to be restored to Greece.—See Perriehos's *History of Suli and Parga* (2d Greek ed., Venice, 1815; Eng. trans. 1823); and Ludmann's *Wars and Ballads of the Suliots* (Leip. 1825).

SULLA, L. CORNELIUS, surnamed by himself FELIX, the ablest Roman after the younger Scipio until the appearance of Julius Cæsar, was b. 138 B.C. His family was a member, but not a distinguished one, of the Cornelian gens, or "clan." In 107 B.C., he was elected questor, and sent to Africa with the cavalry that the consul Marius (q.v.) required for prosecuting the Jugurthine war. He rapidly acquired a brilliant reputation as an officer, and crowned a series of important services by inducing Bocchus, the Mauritanian king, to surrender Jugurtha, whom he brought in chains to the Roman

camp (106 B. C.). Marius was not over well pleased at the distinction achieved by his subordinate. In the campaigns that followed (104–101 B. C.) against the Cimbri and Teutones, Sulla's reputation continued to rise, although Marius was still regarded (and with justice) as the first general of the state. For several years after the destruction of the barbarians, Sulla lived quietly, taking no part in public affairs; but in 93 B. C. he stood for the pretorship, and won it by a liberal distribution of money among the people. Next year, he was sent to Cilicia as propretor, to replace Ariobarzanes on the throne of Cappadocia, from which he had been driven by Mithridates. On his return to Italy (91 B. C.), the long smoldering animosity between Marius and him was on the point of bursting forth, but the terrible *social war* forced all Romans to postpone their quarrels until the common danger had been averted. Both Marius and Sulla commanded armies in this great struggle; but the successes of Sulla threw those of Marius into the shade, and the mortification of his rival was deep and bitter. In 88 B. C., Sulla was elected consul along with Q. Pompeius Rufus, and the senate conferred on him the command of the Mithridatic war. But this was a command that Marius himself passionately desired, and when he heard that Sulla had obtained it, he rushed headlong into treason and civil war.

Here it may perhaps be necessary to observe that Marius and Sulla were not only personal rivals, but the leaders of opposite political parties. The former, a man of humble origin (see *Marius*), was a rough, stubborn, irascible, and illiterate *plebeian*; the latter, a finely cultivated *patrician*, subtle and sagacious in policy, and winning in manners. In the terrible scenes that ensued, although Sulla showed himself by far the fiercer and more sanguinary of the two, it should not be forgotten that it was Marius who commenced the contest. Allying himself with the tribune P. Sulpicius Rufus, a political adventurer in difficulties, Marius placed himself at the head of the new Italian party, on which the rights of Roman citizenship had been conferred, and hoped to force the senate to recall the appointment of Sulla to the command of the expedition to the east. Sulla was compelled to flee to Nola in Campania, where his camp then was; but finding the soldiers full of enthusiasm, he resolved to lead them against the pseudo-government that had been established at Rome. The story of the overthrow of the Marian party, the expulsion of Marius, and his subsequent wanderings in Africa, etc., are well known, and intimately as these events are inwoven with the fortunes of Sulla, cannot be repeated here. Suffice it to say, that after settling affairs at Rome as well as he could, Sulla embarked for the east (87 B. C.), and was away for four years. Most of his fighting, however, was done in Greece against Archelaus, an ally of Mithridates, whom the latter repeatedly subsidized with men and money. Athens was stormed and plundered (86 B. C.), and Archelaus himself was defeated with frightful slaughter at Chæroneia in the same year, and again in the neighborhood of Orchomenos (84 B. C.). Sulla now crossed the Hellespont, crushed Fimbria, a general sent out by the Marian party (which in Sulla's absence, had again got the upper hand in Italy), forced Mithridates to sue for peace, and after extorting heavy contributions from the cities of Asia Minor, sailed for Italy, and landed at Brundisium in the spring of 83 B. C. Marius was now dead, but his party were strong in numbers, if not in organization; yet, before the close of 82 B. C., the Marian party in Italy was utterly crushed. In Spain, however, under the gallant and high-souled Sertorius (q. v.), it held out for ten years longer.

When Sulla felt himself master of the situation, his thoughts turned to revenge. Then followed the fearful period of the *proscriptions* (81 B. C.)—a virtual “reign of terror” throughout Italy, the object of which was literally to extirpate the Marian party. In this, however, it was only partially successful; and the next generation saw that party rise to more splendid predominance than ever in the person of Julius Cæsar (q. v.), nephew of old Marius. In 81 B. C., Sulla got himself appointed dictator, an office which he held until 79 B. C. This period was signalized by his framing a series of laws—often spoken of collectively as the “Sullan legislation”—the design of which was to make the senate and the aristocracy as vigorous and powerful as in the times of the Punic wars, but which utterly failed of its end.

On resigning his dictatorship, Sulla retired to his fine estate at Puteoli, to enjoy at his ease those sensual pleasures to which he had been deeply addicted from his earliest manhood. Literature, wine, and women were luxuries in which he had always indulged, but now he wholly devoted himself to them—in a sort of *swinish* manner. It is strange to reflect that the man who undertook to legislate with the view of mending the public morals, should himself have surpassed in profligacy all his contemporaries. What more convincing proof could we have that morality in Rome had ceased to be more than a name! Sulla's debaucheries hastened his end. He died 78 B. C., when only 60 years of age, of the disgusting disease known as *morbus pediculosis*.

SULLIVAN, a co. in s. w. Indiana, having the Wabash river for its w. boundary separating it from Illinois; 435 sq. m.; pop. '80, 20,336—19,944 of American birth, 146 colored. It is intersected by the Evansville and Terre Haute railroad; drained by the Wabash and Busseron creeks. Its surface is level, with a good supply of timber and groves of hickory and sugar maple. It has extensive beds of bituminous coal. Stock is raised in large numbers, and the soil is adapted to the production of grain, maple sugar, sorghum, and dairy products. Its manufactures are lumber and cooperage. Co. seat, Sullivan.

SULLIVAN, a co. in n. Missouri, crossed by the Burlington and South-western railroad, and drained by Muscle river, the e. fork of Medicine creek, and the middle and w. forks of Locust creek; 648 sq.m.; pop. '80, 16,569. The surface is partly rolling prairie, and partly forest; the soil is fertile. The principal productions are grain, hay, tobacco, wool, and lumber. Horses, cows, mules, sheep, and swine are raised in great numbers. It contains flour and saw mills, and cloth dressing and wool carding are carried on. Bituminous coal is found here. Co. seat, Milan.

SULLIVAN, a co. in w. New Hampshire, bounded by the Connecticut river on the w., and partly by Lake Sunapee on the e., intersected by the Concord and Claremont railroad, drained by the Ashuelot and Sugar rivers; 820 sq.m.; pop. '70, 18,508. The surface bordering the Connecticut is level, other parts of the county consists of rugged hills, covered with forests of oak, ash, sugar maple, and elm trees, and are suitable for grazing; the soil is mostly fertile. The principal productions are grain, hay, potatoes, wool, butter, cheese, and maple sugar. Cattle, horses, sheep, and swine are raised in large numbers. It contains manufactories of cotton, woollen, paper, machinery, boots and shoes, and wooden ware, and tanned and curried leather establishments, also flour and saw mills. Co. seat, Newport.

SULLIVAN, a co. in s.e. New York, having the Delaware river for its w. and s.w. boundary, separating it from Pennsylvania; 980 sq.m.; pop. '80, 32,490—28,230 of American birth, 84 colored. It is drained by the Mongaup, Neversink, Beaver Kill, and Shawangunk rivers, and Rondout creek. It is intersected by the Delaware and Hudson canal; the Erie railroad in the w. and s.w. following the course of the Delaware river, and the New York and Oswego Midland railroad. A branch of the Erie railroad connects its co. seat with Port Jervis. The surface is mountainous, traversed by several lofty ridges divided by fertile valleys. Leather, carriages, and lumber, are manufactured. Co. seat, Monticello.

SULLIVAN, a co. in n.e. Pennsylvania, drained by the Susquehanna river, Loyalsock and Muncy creeks; 420 sq.m.; pop. '80, 8,073—7,151 of American birth, 3 colored. The surface is hilly and includes a part of the Alleghany mountains. It is well timbered with oak and hickory, and an occasional grove of sugar maples. Coal is found, and the soil is adapted to stock raising and the production of grain, potatoes, and dairy products. Leather and lumber are manufactured. Co. seat, Laporte.

SULLIVAN, a co. in n.e. Tennessee, bordered by Virginia, crossed by the East Tennessee, Virginia and Georgia railroad, drained by the Holston river and its branches; 300 sq.m.; pop. '80, 18,321. The surface is hilly and partly covered with forests of sugar maple, beech, oak, ash, chestnut, hickory, and pine. The soil is fertile; the principal productions are wheat, corn, oats, flax, wool, honey, tobacco, maple sugar, and sorghum molasses. It contains large deposits of iron ore and limestone. Co. seat, Blountsville.

SULLIVAN, ARTHUR S., b. England, 1844. He sang as a choir boy in St. James's chapel royal of London, and then studied music in Germany. After his return to England he composed the music to *Cor and Bor*; *The Prodigal Son*; *The Light of the World*; and *Trial by Jury*. His music to Shakespeare's *Tempest* won a great success, and his songs and sacred music have placed him among the leading composers of the day. He is best known, however, as the composer of the comic opera *Pinafore*, for which W. S. Gilbert wrote the words. It was first produced in England, but failed to make the extraordinary but ephemeral success it attained on its reproduction in America at the end of 1878. Sullivan sailed for New York the same year to superintend the production of *Pinafore* under his leadership. He since composed in connection with W. S. Gilbert another comic opera, the *Pirates of Penzance*, which met with considerable success. The honorary degree of doctor of music was conferred upon him by the university of Cambridge in 1876. He was English delegate to the *commission des auditions musicales* of the Paris exhibition of 1878, when he was made chevalier of the legion of honor.

SULLIVAN, JAMES, LL.D., 1744—1808, b. Me.; king's attorney for York county. He sympathized with the patriotic party, however; was in 1775 a member of the provincial congress of Massachusetts from which Maine had not yet been separated, and was sent as a commissioner to Ticonderoga. In 1776 he became a justice of the superior court; was a member of the convention which formed a state constitution for Massachusetts in 1780, and was elected to congress in 1783. Removing to Boston, he represented that town in the legislature several years, served on the executive council, and was probate judge for Suffolk co., and was attorney-general of the state, 1790—1807. He served on the commission to fix the boundaries between the United States and Great Britain, and was governor of the state in 1807—8. He wrote a *History of the District of Maine* (1795), and a *History of Land Titles in Massachusetts* (1801).

SULLIVAN, JOHN, LL.D., 1740—95; b. Me.; in early life was a successful lawyer, but held his profession subservient to his zeal for American liberty. He was a member of the first continental congress; and through the darkest periods of the revolutionary war, he ranked among the ablest leaders of the American armies. In the siege of Boston he was next in command to gen. Lee. When in the battle of Long Island, in 1776, gen. Greene was disabled by sickness, Sullivan was selected to command his division of the

army. Serving afterward under the immediate supervision of Washington, Gen. Sullivan was distinguished for his discretion and valor in the battles of Trenton, Princeton, Brandywine, and Germantown. In 1778 Washington and count d'Estaing arranged for the French fleet to attack the British near Rhode Island, and Sullivan was sent with a large force to co-operate in besieging Newport. On the day appointed for the combined attack, a violent storm so shattered the French vessels that they withdrew from the contest. After defeating the English in one engagement, the American forces retired from Rhode Island. In 1779 Sullivan was sent with a large force into western New York to take vengeance upon the hordes of Indians and Tories who, besides other atrocities, had massacred the inhabitants of Wyoming and Cherry valley. The savages were dispersed, many were killed, and their villages destroyed. In 1780 Gen. Sullivan resigned his commission and returned to New Hampshire and to his profession of the law. After successfully filling many important civil and judicial offices, died at Durham, N. H.

SULLIVAN, JOHN LANGDON, 1777-1865, b. Maine; studied canal construction in England and on the continent. He was agent and engineer of the Middlesex canal, 1804-11. He was associate civil engineer of the U. S. board of internal improvements, 1824-25; and published reports on the feasibility of a canal through the Alleghenies. He afterward practiced medicine, adopting the homeopathic system. In 1814 he received a patent for the invention of the steam tow-boat, being given priority over Robert Fulton.

SULLIVAN, WILLIAM, LL.D., 1774-1839, b. Maine; graduated at Harvard, 1792, studied law, and for many years practiced in Suffolk co.; Mass. He was for a long period a member of the legislature, and is best known as the author of political, historical, and moral *Class Books*; *Familiar Letters on the Public Men of the Revolution* (1834); and *Historical Causes and Effects* (1838).

SULLIVAN'S ISLAND, a large island, 6 m. below Charleston, S. C., between the harbor and ocean, the site of fort Moultrie, now dismantled, and of the summer residences of the wealthy inhabitants. When fort Moultrie was evacuated by Maj. Anderson, Dec. 26, 1830, several batteries were erected on the shore of this island, bearing upon the channel and fort Sumter.

SULLIVANT, WILLIAM STARLING, LL.D., 1803-73; b. Franklinton, Ohio; graduate of Yale college, 1823; became a surveyor and resident of Columbus, and published catalogues and specimens of plants and mosses. He has made contributions to the bryology and hepaticology of North America; to Asa Gray's *Manual of Botany*, and numerous other works, besides contributing valuable papers to scientific journals. Associated with L. Lesquereux he published *Musci Boreali-Americani*, consisting of 350 species and varieties of dried mosses. He discovered a plant of the saxifrage family on which was founded the genus *Sullicautia*.

SULLY, a new co. of s.e. Dakota, bounded on the w. by the Missouri river, and drained by its branches; 1100 sq. miles. The surface is mostly rolling prairie; the soil bordering the Missouri river is very fertile. Co. seat, Fort Sully.

SULLY, MAXIMILIEN DE BETHUNE, Duke of, the celebrated minister of Henry IV. of France, was the second son of François, baron de Rosny, and was born at Rosny, near Mantes, in 1560. The Rosny family, an offshoot from the great house of Flanders, was never possessed of much wealth or influence, and had severely deteriorated in both respects during the early religious wars. Sully was at an early age committed to the care of Henry of Navarre, the head of the Huguenot party, which not only obtained for him an excellent education, but laid the foundation of a companionship which lasted, without intermission, till Henry's death. After narrowly escaping during the St. Bartholomew massacre, he accompanied his patron in his flight from court (1575), and during the civil war which followed, exerted himself to the utmost, by daring valor in the field and otherwise, to serve the master for whom he cherished the most absorbing devotion. After Henry's authority had been well established, Sully, who had for some years previous been his trusted adviser, became (1594) counselor of state and of finance. The financial affairs of the country were then in a frightful condition; from the chief of the department down to the very lowest country agent, the administration was an organized system of pillage, and but a small percentage of the taxes levied found its way into the imperial treasury. The baron de Rosny was the very man to remedy this state of matters; rude, obstinate, and haughty, but at the same time resolute, active, indefatigable, wholly devoted to his master's interests; and backed by the influence of Gabrielle d'Estrees, and by Henry's own clear-sighted convictions, he cared nothing for the clamor and hatred of the court, which had largely profited by the former state of chaos. Not content with regulating the affairs of the revenue from the seat of power, he made a tour through the chief provincial districts, armed with absolute authority, personally examined the accounts, dismissed or suspended delinquents, and largely replenished the treasury with the ill-gotten wealth which he compelled them to disgorge. By indomitable perseverance, he little by little brought the affairs of the country into an orderly state; although in the diminution of the expenditure his efforts were by no means so successful, as the king, his mistresses, and the other companions of his pleasures, combined to oppose all retrenchment as far as they were concerned. In 1596 the disposable revenue of the state was 7 to 9 millions; in 1609 it was no less than 20 millions, with a

surplus of 20 to 22 millions in the treasury, and the arsenals and fleet in a state of excellent equipment. Sully, however, was more than a mere financier; he had the supreme charge of various other branches of the administration, zealously promoted agriculture by diminishing the taxes of the peasantry, encouraging export trade, draining marshlands, and constructing numerous roads, bridges, and causeways. Sully was the servant of the king and government alone, and was of necessity disliked by the people for his severity, by the Catholics for his religion, and by the Protestants for his invariable refusals to sacrifice the smallest jot of his master's or the country's interest for their sake. Accordingly, with the death of Henry, his career of supremacy was at once ended, and he was forced to resign the superintendence of finance, Jan. 26, 1611, though he retained his other high offices, and was presented by Maria de Medicis with 300,000 livres as acknowledgment of his services. He had been created duke of Sully and peer of France in Feb., 1603. Sully wrote three treatises on war and police, which are lost, and two pieces of verse which are extant; but the work which will ever be connected with his name is the *Mémoires des sages et royales (Economies d'Etat de Henry le Grand)*; a dull, wearisome, and disorderly collection of writings, but of priceless value to a historian of Henry IV.'s time. Sully printed the first two volumes of the *Mémoires* at his own château of Sully in 1634, the third and fourth were published at Paris in 1662, and the whole has been several times republished, as well as translated into English, German, and Russian. Sully died at Villebon, near Chartres (Eure-et-Loir), Dec. 22, 1641. Artists have generally represented Sully as older than Henry IV., while in reality he was seven years younger.

SULLY, THOMAS, 1782-1872. b. England; brought to this country by his parents. From 1798-1804 he resided in Charleston, S. C., studied art and produced some juvenile pieces. He then settled in Richmond, Va., and later in New York, in both places practicing the profession of a portrait painter with great success. In 1809 he removed to Philadelphia, where the rest of his life was spent, with exception of visits abroad, in one of which he painted an excellent portrait of queen Victoria. The Boston museum possesses his most ambitious work, "Washington Crossing the Delaware." Among his best portraits were those of Cooke the tragedian as Richard III., Fanny Kemble, Dr. Rush, Decatur, Jefferson, and Lafayette.

SULMONA, or SOLMONA, a city of southern Italy, province of Aquila, in Abruzzi. Pop. '71, 12,533. It is situated in a vast fertile plain, watered by two rivers, and bounded by hills. It is very well built, having one very wide street in the center of the city. There is a handsome town-hall, a cathedral, and a convent dedicated to St. Pietro Celestino, built with stones from the ancient *corfinium*. It has paper manufactories, dye-houses, and tan-yards. Sulmona was the birthplace of Ovid. In the 8th and 9th centuries, it was sacked by the Saracens, but was restored under the Normans, and has ever since been a flourishing and industrious city.

SULPHATES. See SULPHURIC ACID.

SULPHIDES, METALLIC, formerly known as *sulphurets*, are combinations of sulphur with a metal. Many of them occur native, and form highly valuable ores. They are all solid at ordinary temperatures, and, with the exception of those of potassium, sodium, calcium, strontium, barium, and magnesium, are insoluble in water; they are, moreover, conductors of electricity. Many of them, especially of those that occur native, exhibit very brilliant and characteristic colors. The same metal may have several sulphides, and in general there is a sulphide for each oxide. The sulphides are, however, sometimes the more numerous. Most of these compounds may be fused at a heat a little above redness, and if the air be excluded, the protosulphides (those containing one atom of sulphur and one atom of metal) remain unaffected; but many of the higher sulphides, such as the bisulphide of iron (FeS_2) and the bisulphide of tin (SnS_2) give off an atom of sulphur, and are reduced to protosulphides. If, however, there is a free admission of air or of oxygen gas to the heated sulphides, they are all decomposed, the sulphur becoming oxidized, and passing off as sulphurous acid (SO_2), while the metal usually remains in combination with oxygen. When heated before the blowpipe, most of the sulphides evolve an odor of sulphurous acid, and very small quantities of soluble sulphides may be detected in neutral or alkaline solutions by the addition of a solution of nitroprusside of sodium ($\text{Na}_2\text{Fe}(\text{CN})_5\text{NO}_2 + 4\text{Aq}$), when a magnificent purple color, which, however, is not permanent, is evolved. It has very recently been discovered by Mr. Barrett, and announced in his paper, "On some Physical Effects produced by the contact of a Hydrogen Flame with various Bodies," in the *Philosophical Magazine* for Nov., 1865, that the sudden appearance of a blue color when the hydrogen flame is brought in contact with a body containing sulphur, is a most delicate test for the presence of this element, detecting it even when the nitro-prusside of sodium test fails. By this test Mr. Barrett detected $\frac{1}{100,000}$ of a grain of sulphur.

The sulphides are prepared in various ways, of which it is sufficient to notice the most important. (1.) The protosulphides of the metals of the alkalies and alkaline earths may be obtained by decomposing their sulphates by igniting them in closed vessels with charcoal, the oxygen being removed in the form of carbonic oxide. (2.) Many of the metals, when heated with sulphur, combine directly with it; sulphide of iron, for example, is usually prepared in this manner. (3.) Hydrated sulphide of tin, titanium, molybdenum,

tungsten, vanadium, arsenic, antimony, bismuth, copper, lead, mercury, silver, gold, and platinum with its allied metals may be obtained by passing a stream of sulphuretted hydrogen through neutral or acid solutions of their salts, when they are precipitated in an insoluble form; and the hydrated sulphides of zinc, iron, manganese, cobalt, and nickel may be prepared by double decomposition, by mixing a solution of the salt of the metal with a solution of a sulphide of one of the metals of the alkalies, as, for example, sulphide of potassium: thus, sulphate of zinc, if mixed with sulphide of potassium, yields sulphate of potash, which remains in solution, and sulphide of manganese, which falls as an insoluble precipitate. "In many cases," says prof. Miller, "the atoms of these hydrated sulphides are characteristic of the metal; for example, the hydrated sulphide of zinc is white; that of manganese, flesh red; those of cadmium, arsenic, and persulphide of tin are yellow; that of tersulphide of antimony is orange red; and that of hydrated protosulphide of tin is chocolate brown. The sulphides of molybdenum, rhodium, iridium, and osmium are brown, each with its peculiar shade, while in a large number of instances—including the sulphides of iron, cobalt, nickel, uranium, vanadium, bismuth, copper, lead, silver, mercury, gold, platinum, and palladium—the precipitated sulphides are of a black, more or less pure."—*Inorganic Chemistry*, 2d ed. 1860, p. 322. A recollection of the colors of these precipitates will save the young chemist a large amount of labor in testing for the presence of the metals.

SULPHOCYAN' OGEN AND THE SULPHOCYANIDES. The former of these terms is given to a monobasic radical, C_2NS_2 , or CyS_2 , which has never yet been isolated, but which forms an acid compound, known as hydrosulphocyanic acid (H, C_2NS_2), with hydrogen, and yields numerous metallic salts. These salts, known as sulphocyanides, may be represented by the general formula, M, CyS_2 , where M represents any metal. The sulphocyanides of potassium, sodium, and ammonium are crystallizable and soluble in water; those of the heavy metals are comparatively insoluble. These salts do not possess the poisonous character of the cyanides. *Sulphocyanide of potassium* (K, CyS_2) is anhydrous, but very deliquescent, and occurs in long streaked colorless prisms, somewhat resembling niter both in appearance and taste; it is extremely soluble in water, and fuses on the application of a gentle heat. The *sulphocyanide of mercury* is a white powder which possesses the property of swelling or growing in size to an almost incredible degree when moderately heated, so as to decompose it into a mixture of mellon ($C_{18}N_{12}$), with a little sulphide of mercury. The resulting mass often assumes a most fantastic shape, and is sufficiently coherent to retain its form; it is of a yellow color externally, but black within. It is this sulphocyanide which is the ingredient of the well-known toy known as "Pharaoh's serpents." Each serpent consists of a little cone of tinfoil, resembling a pastille in shape, and filled with the above-named compound. On lighting the cone at the apex, there begins to issue from it a thick serpent-like coil, which continues twisting and increasing in length to an extraordinary degree, the serpent-like shape resulting from the salt being burned in the tinfoil cone. The compound is readily obtained by precipitating a strong solution of pernitrate of mercury with sulphocyanide of ammonium, which is most cheaply prepared by Mr. Wood's method from bisulphide of carbon.

SULPHOVINIC OR SULPHETHYLIC ACID (HO, C_4HO, S_2O_6) is formed by mixing alcohol with an equal bulk of oil of vitriol. Great heat is evolved, and the two bodies enter partially into combination; this new compound acid possessing only half the saturating capacity of sulphuric acid. In connection with the theory of the formation of ether from alcohol and sulphuric acid, it may be observed that this sulphovinic acid is developed as an intermediate product, if the temperature be raised to 212° , but not otherwise. This is one of the class of acids to which the term *vinic acids* is applied.

SULPHUR (symb. S, eq. 16—new system, 32—sp. gr. of rolled sulphur, 1.98 [see ATOMIC WEIGHTS], and of amorphous sulphur, 1.957; sp. gr. of vapor, 6.617 at 824° , and 2.2 at 1900° , atmospheric air being the unit of comparison for the vapor) is one of the most important of the non-metallic elements. At an ordinary temperature, it exists as a solid, brittle, tasteless, and inodorous body, of a characteristic yellow color, and insoluble in water. A piece of solid sulphur, heated to a temperature of 239° , fuses into a thin yellow liquid; while in closed vessels, it may, by a further heat, be distilled, the boiling-point being about 824° , and at this temperature it yields a deep yellow vapor, of sp. gr. 6.617. When the sulphur-vapor comes in contact with cold air, it condenses in the form of a fine yellow powder, known as *flowers of sulphur*. If fused sulphur be rapidly cooled, it solidifies into a compact mass, of a granular crystalline texture, and if, in its liquid state, it be allowed to run into cylindrical wooden molds, we obtain it in the ordinary form of roll-sulphur, or common brimstone; if, on the other hand, it be allowed to cool slowly, it crystallizes in long, glistening, deep, yellow, oblique prisms, with a rhombic base, which, however, soon lose their most characteristic properties. As native sulphur is frequently met with in yellow crystals, whose form is derived from the octahedron with a rhombic base, it is obviously a dimorphous substance. It has been already stated that sulphur fuses at 239° ; from that temperature up to 280° , it forms a yellow, transparent, limpid liquid; as the heat increases, the color becomes brown, and almost black, and the liquid becomes viscid, these changes being very distinctly seen at 350° . If the external application of heat be steadily continued, it will be found that for

a while the temperature remains constant, but it afterward rises, and at nearly 500°, the sulphur again liquefies, although less completely than when first melted. If it be now suddenly cooled by pouring it, in a slender stream, into cold water, we obtain a spongy, tenacious, and plastic mass, which may be drawn out into elastic threads, whose color, after they have cooled, varies from an amber to a deep brown color, according to the heat that has been employed. After some hours the ductile sulphur loses its characteristic properties, increases in density, and returns to the brittle form; or, if it be heated to 212°, it suddenly returns to the brittle condition; the temperature rising to 230° during the change. Hence, sulphur may be obtained in three (if not in more) allotropic states, which are distinguished by the symbols S_α , S_β , S_γ . The first variety, S_α , is the native octahedral crystal of sulphur; it may be obtained artificially by dissolving sulphur in bisulphide of carbon, or chloride of sulphur, and submitting the solution to spontaneous evaporation. These crystals are semi-transparent, of an amber-yellow color, and undergo no change on exposure to the air. The second variety, S_β , is the oblique prismatic crystal already described as being formed when fused sulphur cools slowly. The best method of obtaining these crystals is to melt a few pounds of sulphur, and allow it to solidify on the surface. On perforating the external crust with a hot wire, and pouring out the sulphur that remains liquid, the interior of the cavity is found to be traversed in all directions by these crystals, occurring as transparent brownish needles, having a specific gravity considerably less even than that of roll sulphur. On exposure to the air they soon lose their coherence, and form an opaque and crumbling mass, consisting of minute rhombic octahedra. This conversion of the prismatic into the octahedral form takes place immediately if the prisms are immersed in bisulphide of carbon. The third variety, S_γ , is the plastic amorphous sulphur, which has been sufficiently described. If sulphur be frequently heated to 600°, and suddenly cooled, a black variety of this element is produced; and a red variety has been obtained, but the redness is now supposed to be due to the presence of a trace of some fatty body.

Sulphur is a bad conductor of heat, and the mere heat of a warm hand often causes it to crackle, and even to fall to pieces, from the unequal expansion. It is an insulator of electricity, and becomes negatively electric by friction. It is slightly soluble in alcohol, ether, and the fatty oils; its best solvents being the bisulphide of carbon and chloride of sulphur. When it is heated in the air, it takes fire at about 470°, burning with a blue flame, and becoming converted into sulphurous acid, whose pungent suffocating fumes are characteristic of sulphur. This element is second only to oxygen in its powerful affinity for other elements, with most of which it unites, and often in several proportions. With most of the metals it combines very readily, and in some cases, with a development of light and heat; thus, silver and copper burn in sulphur-vapor just as iron-wire or zinc-foil burns in oxygen. In consequence of its power, with the aid of heat, of forming sulphurous acid with the oxygen of the air, and thus rendering the latter incapable of supporting combustion, burning sulphur may be usefully employed for the extinguishing of fire—as, for example, in chimneys.

Sulphur occurs very widely distributed in the mineral kingdom, partly free and partly combined with other elements. The free sulphur is either found pure in regularly formed crystals, or intimately mixed with earthy matters. The principal sources of crystalline sulphur are Urbino in Italy, Girgenti in Sicily, and Radoboy in Croatia; while the earthy sulphur is mainly derived from Italy, Moravia, and Poland. Iceland is rich in both varieties, but the mineral wealth of that island remains almost unworked. At present, by far the greatest quantity of the sulphur employed in Europe comes from Sicily; and, as a general rule, it is abundant in volcanic districts. In the form of sulphide, sulphur occurs abundantly in combination with iron, copper (iron and copper pyrites), lead (galena), zinc (blende), etc., the bisulphide of iron (or iron pyrites) furnishing most of the sulphur that is employed in the manufacture of sulphuric acid. Sulphur is still more extensively distributed in the form of sulphates, the sulphates of lime, magnesia, baryta, etc., being abundant natural productions. In the vegetable kingdom, sulphur is a constituent (although only to a small amount) of the albuminous bodies which are so widely diffused in plants; and of certain volatile irritant oils, as those of mustard, garlic, asafetida, etc.; and, moreover, the vegetable juices contain it in the form of certain sulphates. In the animal kingdom, it is not only a constituent of the albuminous, fibrinous, and gelatinous tissues, but of the hair, saliva, bile, urine, etc. The two animal substances in which it is most abundant are cystin (q.v.), an occasional constituent of urinary calculi, and taurine (q.v.), a constituent of the bile, in both of which it forms about a quarter of the entire weight.

It would be out of place in this article to enter into details regarding the *extraction* or *preparation* of sulphur. It is sufficient to state that the grosser impurities are removed by crude processes of fusion and distillation at or near the place from whence it is obtained. That which is imported into Britain undergoes further purification. What is called *refined sulphur* is that purified by distillation in a large cast-iron still, and condensed in a receiver kept cool. When the vaporized sulphur is condensed in a large chamber, it is obtained in the form of *sublimed sulphur*, or *flowers of sulphur*; but as the walls get hot, it melts and collects on the floor, and is run into cylindrical wooden molds, from which, when cool, it is taken out as *roll* or *stick sulphur*. The residue left in the retort is a mixture of sulphur with various impurities. Under the names of *black*

sulphur, or *sulphur vivum* (commonly inquired for at the chemist's under the title of *sulphur of ivy*), it is used in veterinary medicine, and for the purpose of dressing moldy hops. Sulphur is thrown down from certain of its compounds (as from a strong solution of a polysulphide of calcium, sodium, or potassium) by dilute hydrochloric acid; it falls as a grayish-white, very fine, light powder, known in the *Materia Medica* as *milk of sulphur*, or *precipitated sulphur*. For the method of obtaining sulphur from iron pyrites, we must refer the reader to Miller's *Inorganic Chemistry*, 2d ed. p. 154. The proceeding is usually conducted on a large scale, 2,000 tons of pyrites being roasted at once, the roasting extended over five or six months, and the final result being about 20 tons of sulphur. The most common impurities met with in ordinary commercial sulphur are selenium and realgar (bisulphide of arsenic). Flowers of sulphur frequently exhibit a slight acid reaction, in consequence of a little sulphurous acid clinging to them. By rinsing them with water, this impurity is at once removed.

Sulphur is extensively employed in the arts and manufactures; as in the manufacture of matches, gunpowder, etc. When converted into sulphurous acid, it is employed as a powerful bleaching agent, and also for the destruction of insects, fungi, etc.; but its chief consumption is in the manufacture of sulphuric acid.

The compounds of sulphur and oxygen are no less than seven in number, all of which present the characters of acids. These acids have the following composition:

		Sulphur.	Oxygen.
Sulphurous acid.....	SO ₂	16	16
Sulphuric acid.....	SO ₃	16	24
Hyposulphurous acid.....	S ₂ O ₂	32	16
Hyposulphuric acid.....	S ₂ O ₅	32	40
Trithionic acid.....	S ₃ O ₅	48	40
Tetrathionic acid.....	S ₄ O ₅	64	40
Pentathionic acid.....	S ₅ O ₅	80	40

The last five of these acids have never been obtained in the anhydrous form. We shall only notice the most important members of this group, viz., the first three of them, and of these, the second, *sulphuric acid*, is so extremely important, that it is discussed in a special article. (The last three derive the essential portion of their name from the Greek word *thion*, sulphur.)

SULPHUROUS ACID or SULPHUROUS ANHYDRIDE (SO₂), occurs under the ordinary relations of temperature and pressure as a colorless gas, possessing the suffocating odor of burning sulphur. In its concentrated form it is quite irrespirable, and in a diluted state it excites cough, and produces the symptoms of an ordinary catarrh. It is not only incapable of burning, but it rapidly extinguishes the flame of burning bodies. It is very freely soluble in cold water, which at 32° takes up nearly 69 times its volume of the gas, while at 75° it only takes up 32 volumes; the solution known as *aqueous sulphurous acid* having at first the same smell and taste as the gas, but soon absorbing oxygen from the air, and becoming converted into sulphuric acid. By the action of cold, sulphurous acid may be condensed to a colorless transparent limpid liquid, which freezes at -105°, forming a transparent crystalline solid. The specific gravity of the gas is 2.247 (atmospheric air being the unit), and that of the liquid is 1.49 (water being the unit), the solid being considerably heavier. Although dry sulphurous acid gas and dry oxygen, when mixed, exert no action on one another, there are many conditions under which sulphurous acid rapidly absorbs oxygen, and is converted into sulphuric acid. It has been mentioned that this takes place if the gas be dissolved in water; a similar action takes place under the influence of hydrated nitric acid, iodic acid, and certain metallic oxides. For example, oxide of lead, when immersed in the gas, burns, and is converted into white sulphate of zinc (PbO₂ + SO₂ = PbO₂SO₂). Hence, sulphurous acid is a powerful reducing or deoxidizing agent. This gas is a common and abundant product of volcanic action, and is occasionally met with in solution in the springs in volcanic regions. It may be prepared artificially by simply burning sulphur in the air or in oxygen gas, or by heating in a flask 4 parts of flowers of sulphur mixed with 5 parts of powdered black manganese, sulphurous acid and sulphide of manganese being the products, as shown by the equation 2S + MnO₂ = SO₂ + MnS. In consequence of its solubility in water, this gas should be collected over mercury. In addition to the uses of sulphurous acid as a bleaching agent, it is valuable both as a disinfectant agent and as a powerful antiseptic; its latter property has been applied to the preservation of meat, which, after exposure to this acid, will keep fresh for years, if it be inclosed in metallic canisters filled with nitrogen, to which a little bin oxide of nitrogen has been added, to remove any trace of oxygen. But by far its most important use is, as a first stage in the manufacture of sulphuric acid. In combination with bases, this acid forms the *sulphites*—a class of salts which, excepting the sulphite of soda, are of little practical importance, except for their power, when moist, of extracting oxygen, and thus acting as reducing agents. For example, the salts of the sesquioxide of iron are reduced by them to salts of the protoxide.

HYPOSULPHUROUS ACID (S₂O₂) as yet is only known in a state of combination with bases; for on attempting to separate the acid from the base, the former becomes decom-

posed into sulphur and sulphurous acid. The most important of its salts is the *hyposulphite of soda* ($\text{NaO}, \text{S}_2\text{O}_2 + 5\text{Aq}$), whose mode of preparation and characters are described in the article **SODIUM**. This and other soluble hyposulphites may be easily recognized by the facility with which they dissolve the haloid salts of silver, forming a solution of an extremely sweet taste, and containing a double hyposulphite of silver and soda, with an admixture of chloride, iodide, or bromide of sodium. It is this power of dissolving those salts of silver which are insoluble in water, that renders the hyposulphite of soda so important an agent in photography. The only other salt of this acid which we shall notice is the *hyposulphite of gold and soda* [$\text{AuO}, \text{S}_2\text{O}_2.3 (\text{NaO}, \text{S}_2\text{O}_2) + 4 \text{Aq}$] which may be prepared by mixing concentrated solutions of 1 part of chloride of gold and 3 parts of hyposulphite of soda, and adding alcohol, when the required salt is precipitated. It is used for gilding the daguerreotype plate, and for coloring the positive proof obtained in photographic printing.

With hydrogen, sulphur forms two compounds, viz., *sulphureted hydrogen*, or *hydrosulphuric acid* (q.v.), and *persulphide of hydrogen*, an oily liquid, having the smell and taste of sulphureted hydrogen, and in many of its properties having an analogy to binoxide of hydrogen. Sulphur combines with carbon to form a *bisulphide of carbon* (CS_2), a very volatile colorless liquid, of a high refractive power, of an acid and pungent taste, and a very disagreeable odor. It is heavier than water, in which it is insoluble, but dissolves freely in alcohol and ether, and is the best solvent for sulphur and phosphorus. Bisulphide of carbon does not occur as a natural product, but may be obtained by heating fragments of charcoal to bright redness in a porcelain tube, and passing sulphur vapor along it. Its vapor, when freely inhaled, exerts a similar anæsthetic action with those of chloroform and ether. Workmen in caoutchouc or other manufactures in which bisulphide of carbon is used as a solvent, suffer very much from prolonged exposure to its vapor, which produces headache, loss of appetite, impairment of vision and hearing, and causes general derangement of health by its deleterious action on the nervous system. Sulphur combines with chlorine in several proportions, the most important of these compounds being *subchloride of sulphur* (S_2Cl) and the *chloride of sulphur* (SCl). Both of them are liquids, and are formed by the direct action of the combining elements. The subchloride is a yellow volatile liquid with a penetrating and disagreeable odor. When dropped in water, it sinks to the bottom (its spec. grav. being about 1.687), and is slowly decomposed into hydrochloric and various sulphur acids, and free sulphur. It is capable of dissolving about 67 per cent of sulphur at an ordinary temperature, and, like bisulphide of carbon, is extensively employed in vulcanizing india-rubber. The chloride of sulphur is formed by saturating the subchloride with chlorine. It is a deep-red liquid, resembling the previous compound in most of its properties. It is decomposed by the sun's rays into the subchloride and free chlorine.

With regard to the history of sulphur and its compounds, it may be observed that sulphur seems to have been known from the earliest times, and that sulphuric acid was most probably known to the Arabians. The manufacture of English sulphuric acid dates, however, only from the 18th century. Sulphurous acid was first investigated by Stahl, Scheele, and Priestley; hyposulphuric acid was discovered by Welter and Gay-Lussac; hyposulphurous acid, by Gay-Lussac and Herschel; trithionic acid, by Langlois; tetrathionic acid, by Fordos and Gelis; and pentathionic acid, by Wackenroder. Scheele was the first who accurately studied hydrosulphuric acid, or sulphureted hydrogen.

Sulphur is used to a considerable extent and for very different purposes in medicine. It is given internally either as sublimed sulphur (flowers of sulphur) or as precipitated sulphur (milk of sulphur), in somewhat large doses, as a mild cathartic—its purgative effects being due to its stimulating the muscular coat of the intestines. In consequence of its being both gentle and sure in its action, it is the best purgative to employ in cases of piles, or in stricture or other painful affections of the rectum. The only objection to its use is that, from its becoming partly converted in the system into sulphureted hydrogen, the evacuations, and even the insensible perspiration, often become abominably fetid and continue so for some time after the primary operation of the medicine. As a purgative, the dose is about two drams, made into an electuary with treacle or honey. It is, however, generally combined with jalap and cream of tartar.

The *confection of sulphur* of the Pharmacopœia is composed of sulphur, cream of tartar, and syrup of orange-peel rubbed together—the dose being from half an ounce to an ounce, or from one to two tablespoonfuls. In small doses, sulphur is of great value in cases of atonic gout and chronic rheumatism. An electuary known as the *Chelsea pensioner*, consisting of two ounces of sublimed sulphur, one ounce of powdered rhubarb, half an ounce of resin of guaiacum, one ounce of cream of tartar, half an ounce of ginger, and two drams of powdered nutmegs, with as much treacle as is necessary, in doses of one or two teaspoonfuls night and morning, is a combination of great value in these cases. It originally gained its reputation by curing Lord Amherst of rheumatism, and is still a favorite remedy at Chelsea hospital. Dr Nelligan states that steaming the lower bowel, by sitting over the vapor of warm water upon which a tablespoonful of flowers of sulphur had been sprinkled, constitutes a most valuable remedy in what is popularly known as a 'fit of the piles.' The external use of sulphur in the form of

ointment has been already noticed in the article IRON. It is also used externally in many other cutaneous disorders, particularly in lepra and psoriasis; and in chronic cases, its application in the form of vapor is often of great service.

SULPHURIC ACID, or, more correctly, hydrated sulphuric acid (SO_3, HO), is the chemical name of the liquid commercially and popularly known as *oil of vitriol*.* It is a dense, colorless, oily liquid, without smell, of a spec. grav. of 1.846 at a temperature of 60° , and of an intensely acid taste and reaction. It has a powerful caustic action, and chars and destroys organic matters from its strong affinity for water; and in consequence of this destructive property, it must always be handled with the greatest caution. So powerful is this affinity, that if the acid be exposed for a few days to the air in a shallow dish, so as to present a large surface, it often doubles its weight by absorbing aqueous vapor from the air; and in consequence of its possessing this property it is extensively used in laboratory operations as a desiccating agent. It mixes completely with water in all proportions, and as great heat is given out at the moment of mixture, the dilution should be performed by very gradually adding the acid to the water. When cold the mixture occupies less bulk than the two components previously occupied. This acid freezes at a temperature of 15° , and boils at 620° (or according to Marignac, at 640°), and just above the boiling-point it assumes the form of a vapor, with a spec. grav. of 2.15. Oil of vitriol, or the protohydrate, is not the only hydrate of sulphuric acid. Three others are known to exist. When the fuming oil of vitriol of Nordhausen is exposed to a low temperature, a white crystalline substance separates, which is a hydrate, containing half as much water as the common liquid acid. Its formula is $2\text{SO}_3, \text{H}_2\text{O}$, or $(\text{SO}_3)_2\text{HO}$. Its fusing point is 95° . Then, again, a mixture of 49 parts of strong liquid acid and 9 parts of water ($\text{SO}_3, 2\text{H}_2\text{O}$) freezes at 47° , and crystallizes into splendid rhombic prisms, from which property it is often termed *glacial sulphuric acid*. It boils at 435° , and its spec. grav. is 1.780. Lastly, when a very dilute acid is concentrated by evaporation *in vacuo*, at 212° , till it ceases to lose weight, there will be a resulting compound, consisting of 40 parts of the real acid, and 27 of water, and represented by the formula, $\text{SO}_3, 3\text{H}_2\text{O}$. It boils at 348° , and its spec. grav. is 1.602. There are thus no less than four hydrates of sulphuric acid—viz.: (1) the dihydrate, $2\text{SO}_3, \text{H}_2\text{O}$; (2) the ordinary protohydrate, $\text{SO}_3, \text{H}_2\text{O}$; (3) the bihydrate, $\text{SO}_3, 2\text{H}_2\text{O}$; and (4) the trihydrate, $\text{SO}_3, 3\text{H}_2\text{O}$. The compound formerly known as *anhydrous sulphuric acid* possesses none of the characteristic properties of an acid. See SULPHURIC ANHYDRIDE; also CHEMISTRY.

Sulphuric acid in its free state is a very rare natural product; although, in combination with bases, it is common in the animal and vegetable, and abundant in the inorganic kingdom. The only cases in which it is known to occur free are certain American rivers, especially the rio Vinagre, and some lakes in Tennessee and in Java; and it has been found to be a normal constituent of the saliva of *dolium galia*, a species of snail found in Sicily. In all these cases the acid is, of course, in an extremely diluted form. In plants it exists in the juices, and in animals in the blood and its derivative chiefly in the form of sulphates of the alkalies; while in the mineral kingdom it occurs as gypsum (sulphate of lime), heavy spar (sulphate of baryta), celestine (sulphate of strontia), etc.

Sulphuric acid may be prepared on a small scale by boiling sulphur in *aqua regia*, or in nitric acid, the sulphur becoming gradually oxidized into sulphuric acid. As a general rule, however, the commercial acid is employed even for laboratory experiments. See below.

In order to obtain the acid in a pure form, suitable for medical use or medico-legal analyses, it must be redistilled with sulphate of ammonia in a retort containing a few slips of platinum foil, the first and last portions being rejected. The distillation is attended with violent concussions, partly owing to the high specific gravity of the acid, and partly owing to its high boiling-point, and this convulsive action is moderated mechanically by the platinum slips. Sulphuric acid thus prepared according to the direction of the British pharmacopœia may be regarded as perfectly pure, presuming arsenic is not present. Strong sulphuric acid has comparatively little action on the metals except at a high temperature, when it dissolves them, and, at the same time, undergoes partial decomposition; the metal being oxidized by a portion of the acid which becomes decomposed into oxygen and sulphurous acid, and then uniting with a portion of undecomposed acid to form a sulphate. Silver, copper, mercury, arsenic, antimony, bismuth, tin, lead, and tellurium are thus acted on. Gold, platinum, rhodium, and iridium are not affected by the acid even at a boiling temperature. The more oxidizable metals, such as zinc, iron, nickel, and manganese, are readily soluble in the dilute acid, water being decomposed, and hydrogen liberated, while the oxygen of the water unites with the metal; and the metallic oxide, at the moment of its formation, combines with the sulphuric acid to form a sulphate.

The *sulphates*—or salts formed by the combination of sulphuric acid with a base—are generally composed, as in the case of green vitriol ($\text{FeO}, \text{SO}_3 + 7\text{Aq}$), of 1 equivalent of acid and 1 of metallic oxide, with or without water of crystallization. With the alkalies this acid also forms acid salts, as bisulphate of potash, and in a few cases—copper,

* It received this name from having been first produced by the distillation of green vitriol (sulphate of iron); Basil Valentine being usually credited with the discovery. See ALCHEMY.

for example—it forms basic salts. The insoluble sulphates, such as that of baryta, may be obtained by precipitating a soluble salt of the base by a soluble sulphate; thus, nitrate of baryta and sulphate of soda yield an insoluble sulphate of baryta and nitrate of soda, which remains in solution. The soluble sulphates may be prepared by dissolving the oxide or carbonate in dilute sulphuric acid, in those cases in which the metal itself is not readily attacked by the acid. Sulphuric acid and the soluble sulphates are easily detected by their yielding, with a solution of a baryta salt, a white precipitate of sulphate of baryta insoluble in acids.

This acid is employed in the arts and manufactures for a large number of purposes. Its use as a desiccating agent for laboratory purposes has been already noticed, and its application to the development of oxygen gas has been described in the article on that element. But its greatest consumption, doubtless, is in the preparation of the *salt-cake*, which is used in the manufacture of carbonate of soda (q.v.).

In medicine a *dilute sulphuric acid*, formed by gradually mixing three fluid ounces of the strong purified acid with thirty-five fluid ounces of water, or *aromatic sulphuric acid* (known also as *elixir of vitriol*), prepared by mixing three ounces of sulphuric acid with a quart of rectified spirit, adding cinnamon and ginger, digesting for a week, and filtering, are almost always employed. In doses of from ten to thirty minims, properly diluted, these preparations exert a strong astringent power, and are serviceable in all forms of passive hemorrhages, and in checking inordinate discharges when they arise from debility. In ordinary diarrhœa, and even in the premonitory diarrhœa of cholera, dilute sulphuric acid is of great use. In painter's colic it is given in order to convert any lead that is absorbed into an insoluble sulphate, which is inert. Sulphuric acid lemonade is also used as a prophylactic against the disease. As this acid exerts a deleterious action on the teeth, it should be directed to suck it through a quill. In some cases it is prescribed not so much for its specific as for its solvent power; with this object it is usually prescribed with quinia. The strong acid is used in surgery as a caustic. In cases of *poisoning* with this acid the most prominent features are, burning pain extending from the mouth to the stomach, intense pain in the bowels, vomiting, great prostration, coldness of the surface, and fetor of the breath. The mucous membrane of the parts injured by the acid is at first converted into a white slough, which soon becomes black, and the patient usually dies from exhaustion within twenty-four hours. The best antidotes are the alkaline bicarbonates, or carbonate of magnesia. If the primary symptoms be conquered the patient often dies subsequently from stricture of the œsophagus.

Sulphuric Acid Manufacture.—There are two distinct processes by which sulphuric acid is at present prepared on a large scale—viz., by the distillation of green sulphate of iron—the original process of Valentine; and by the oxidation of sulphurous acid through the agency of nitrous acid and hyponitric acid. The first process is chiefly employed at Nordhausen, in Prussia, and is thus described by Fownes: "The sulphate of iron, derived from the oxidation of iron pyrites, is deprived by heat of the greater part of its water of crystallization, and subjected to a high heat in earthen retorts, to which receivers are added as soon as the acid begins to distill over. A part gets decomposed by the very high temperature; the remainder is driven off in vapor, which is condensed by the cold vessel containing a very small quantity of water or common sulphuric acid. The product is a brown oily liquid of about 1.9 specific gravity, fuming in the air, and very corrosive. It is chiefly used for the purpose of dissolving indigo."

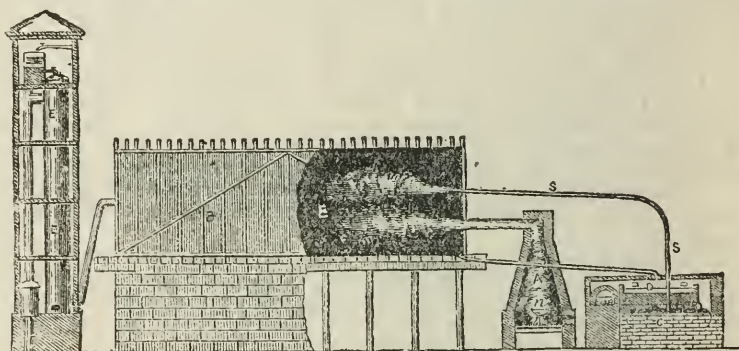
The second method is that universally followed in Great Britain, the germs of which were likewise discovered by Valentine. He observed that when the fumes of burning sulphur were collected under a bell jar, slightly moistened with water, a small quantity of liquid was deposited. This liquid, which was simply sulphuric acid, on being concentrated from its solution by boiling, was long sold as oil of sulphur *per campanum* at prices as high as 2s. 6d. per ounce.

About the year 1740, the French chemists Lefevre and Lemery suggested that, by the use of niter along with the sulphur, the operation might be conducted in close vessels, and a much greater quantity of acid might be produced. This idea was acted on in England by a Dr. Ward, who established works at Twickenham and Richmond, conducting his manufacture by burning the mixed sulphur and niter in large stoppered glass receivers, into each of which a small quantity of water was first introduced. The substitution, by Dr. Roebuck of Birmingham, of lead chambers in place of glass vessels, may be regarded as essentially the establishment of the process of manufacture followed at the present day. Dr. Roebuck established his first works at Prestonpans in 1749.

The first stage in the manufacture of sulphuric acid is the preparation of sulphurous acid by the burning of sulphur or of iron pyrites. Previous to the year 1833, Sicilian sulphur was almost exclusively used in the manufacture, but in that year the very ill-advised establishment of a monopoly of the sulphur trade by the Sicilian government, and its consequent increase in price, diverted the minds of manufacturers to the employment of iron pyrites (sulphuret of iron), the use of which, as a source of sulphurous acid, was already not unknown. The monopoly was quickly abolished, on the representations of the English government, but not until it was demonstrated that the world was independent of Sicily both for sulphuric acid and sulphur. Iron pyrites is now much more used than sulphur, and the only hindrance to its universal adoption

is the presence of foreign matter in the pyrites, the most deleterious being arsenical compounds; and it has hitherto been found impracticable to free the sulphuric acid wholly from the arsenious acid which consequently accompanies it. This renders the acid prepared from pyrites inapplicable for many purposes.

When sulphur is the material used for producing the sulphurous acid, it is burned in an oven or "burner" (A) of brick-work, having a sole or bottom of iron, termed the "burner-plate." Under this a small fire is at first lighted, which is allowed to go out after the sulphur has ignited. A little above the sulphur, a small pot, called the niter pot, *n*, is either placed on a stand or hung from the roof, filled with a quantity of either nitrate of soda or nitrate of potash, with sulphuric acid sufficient for its decomposition—8 or 10 lbs. of the niter, with 5 or 6 lbs. of sulphuric acid, being allowed for every cwt. of sulphur. The decomposition of the niter by the action of heated sulphuric acid furnishes nitric acid fumes, which go over into the chamber along with the sulphurous acid. The sulphurous readily abstracts from the nitric acid the additional equivalent of oxygen required for its conversion into sulphuric acid, reducing the nitrous compound from nitric acid, NO_3 , to nitrous oxide, NO_2 ; the reaction being thus: $3\text{SO}_2 + \text{NO}_3 = 3\text{SO}_3 + \text{NO}_2$. Nitrous oxide in its turn quickly converts itself into nitrous acid, NO_3 , by the abstraction of two additional equivalents of oxygen from the air that is constantly entering the chamber through the burners. Again, in the presence of moisture, which is supplied by a jet of steam from the boiler C, sulphurous acid readily deprives the nitrous acid of two equivalents of oxygen, and thus forms two more volumes of sulphuric acid, and again liberates nitrous oxide; which is ready once more to seize upon the oxygen of the air, and would continue so acting and reacting *ad infinitum*.



Manufacture of Sulphuric Acid:

A, sulphur-burner, or furnace; B, lead chamber, shown in section at B'; C, steam boiler; D, leaden pan; E, coke tower; S, steam-pipe; *n*, niter pot.

tum, were it not carried forward and out by the chimney provided for the escape of the freed nitrogen.

The chamber is an immense box or room of lead, bound together with a strong framework of timber, and generally raised on arches several feet above the ground. Chambers vary in size from 60 to 140 ft. in length, and from 20 to 40 ft. in width and height. Curtains of lead proceeding alternately from the bottom to near the top, and *vice versa*, are very frequently used; they serve to retard the progress of the gases, and thus insure the transformations desired. The floor of the chamber is covered with water, into which the sulphuric acid falls as it is formed; and when this solution attains a certain strength, it is tapped off for concentration. When the gases reach the chimney, on account of the reactions of the nitrous compounds already explained, a large amount of nitrous acid would not only be wasted, but would also be deleterious to the neighborhood, were steps for its recovery not adopted. This recovery is usually effected by means of a tower filled with coke, E, down which a constant stream of strong sulphuric acid trickles, the acid absorbing the nitrous fumes in their way upward. Instead of a single chamber, curtained off or not as the case may be, sometimes three or five distinct chambers, connected by pipes, are employed, those communicating directly with the burners being termed working chambers, and the others receiving chambers, the last either acting as or communicating with a condenser or chimney. In France and Germany, the apparatus employed is generally of a more complicated nature, but in principle the operations are identical.

When iron pyrites is used as the source of sulphurous acid, a furnace somewhat on the principle of the ordinary lime-kiln is required. The pyrites is broken into pieces like nuts, washed, and spread in layers on plates heated to redness, and frequently stirred; or a quantity of coke is introduced with the first charge; and the heat evolved by the burning sulphur is thereafter sufficient fuel for the fresh charges. The exhausted ore is frequently sufficiently rich in copper for its extraction; indeed, when there is not

more than $2\frac{1}{2}$ per cent of that metal present in pyrites, it is now recovered, and this has led to the establishment of copper smelting works in connection with great chemical works near Newcastle and Manchester. The use of pyrites necessitates a chamber of comparatively larger size for the production of a given amount than is required when sulphur is used. The increased labor, with the greater quantity of niter washed, and other circumstances, tend to make the cost of acid from both sources nearly equal.

In consequence of strong sulphuric acid absorbing both sulphurous acid and nitrous acid, the acid requires to be drained off from the chamber while the solution is comparatively weak, at which strength, viz., of a specific gravity of about 1.4, it is used for some purposes in the arts, under the name of "chamber acid." This is concentrated by evaporating, in lead pans, D, till it reaches the specific gravity of 1.6, then boiling in a platinum retort, on which strong acid does not act, even at high heat, or in large flint-glass retorts. Platinum retorts are extremely expensive; one to hold 30 gallons costing nearly £900. Large glass retorts which were used before the introduction of the platinum retorts, are again coming into favor with manufacturers. The only objection to their use is the great expense arising from frequent breakages, and consequent loss of both acid and retort.

The manufacture of sulphuric acid is a very extensive industry; immense quantities of it being consumed in the manufacture of soda, in that of bleaching-powder, in calico printing and dyeing, and, in fact, in most chemical operations both in the manufactory and the laboratory. In South Lancashire alone upward of 700 tons of concentrated acid are produced weekly. A process of purification is required for the acid in several of its minor applications; but for general purposes, it is sufficiently pure as supplied by the works.

SULPHURIC ANHYDRIDE, formerly known as **ANHYDROUS SULPHURIC ACID**, is commonly represented by the formula SO_2 , but there are good reasons for believing that the formula should be doubled—or, in other words, that it is a compound of two atoms of sulphur with six of oxygen. It is a colorless crystalline solid, which is tough and ductile, and can be moulded in the fingers like wax without injuring the skin. It liquefies at 65° , and boils at about 112° , forming a transparent vapor if hot water be present. It unites with moisture when exposed to the air, and gives off dense white fumes. When thrown into water, the heat emitted is so great that it hisses as red-hot iron would do; and the solution has all the properties of ordinary sulphuric acid. It may be obtained by the distillation of fuming Nordhausen acid, when white fumes pass over in the cooled receiver, and solidify into a white silky-looking fibrous mass. It may be also obtained by the distillation of acid sulphate of soda (NaO.HO.2SO_2), after it has been deprived of its atom of water. It combines with sulphur, iodine, and hydrochloric acid; but both it and its compounds are of chemical interest rather than practical value. See CHEMISTRY.

SULPHURIC ETHER is a term commonly but improperly applied to ethylic, vinic, or ordinary ether (q.v.) True *sulphuric ether*, known also as *sulphate of ethyl* ($2\text{C}_2\text{H}_5\text{O.S}_2\text{O}_6$), is an oily liquid, of burning taste and ethereal odor, resembling that of peppermint, of specific gravity 1.120 (while that of ordinary pure ether is 0.720), and almost incapable of being distilled without decomposition, as at a temperature of about 250° it resolves into alcohol, sulphurous acid, and olefiant gas.

In the article **ETHER**, reference is made to the anæsthetic properties of that compound. Dr. Richardson has discovered that local insensibility may be readily induced by the application to the skin of the finely divided spray of perfectly pure rectified ether of specific gravity 0.723. The skin blanches in from half a minute to two minutes; and by following the knife with the spray, more than merely superficial incisions may be rendered painless. It has been successfully employed in amputations of fingers and toes, removal of tumors, opening of abscesses, removal of teeth, etc.

SULPHUROUS ACID some years ago became one of the most popular articles in our pharmacopœia. This sudden popularity was mainly due to the researches of a Scottish provincial physician, Dr. Dewar, of Kirkenaldy, who, from beginning his experiments on cattle, during the period of the cattle plague of 1866, extended them to other animals and to man, and obtained remarkable satisfactory results (see *Medical Times and Gazette* for 1867, vol. i., pp. 492, 548). There is, of course, nothing new in applying sulphur-fumes—which in reality are composed of sulphurous acid gas—as a disinfectant. The classical scholar will recollect that Ulysses employed them to remove the unpleasant smell arising from the dead bodies of Penelope's murdered lovers. "Bring brimstone, the relief of evils," he exclaims, "and bring me fire that I may sulphurize the house." —Horn. *Od.* xx, 481, 482. It is also recorded by Ovid (*Fasts*, iv, 735) and other writers that the shepherds of Italy yearly purified their flocks and herds with "the blue smoke of burning sulphur." Professor Graham's remark, that of gaseous disinfectants, sulphurous acid (obtained by burning sulphur) is preferable on theoretical grounds to chlorine, and that no agent checks so effectually the first development of animal and vegetable life, may be said to contain all that was known with regard to the medicinal value of this gas, till Mr. Dewar began his investigations. In his experiments in connection with the cattle-plague he found that the most safe and convenient apparatus consists of a chamber two-thirds full of red cinders, a crucible inserted in the cinders, and

a piece of sulphur-stick. A piece of sulphur as large as a man's thumb will burn for nearly twenty minutes, and will suffice for a cowhouse containing six animals; and it appears undoubted that if there be due ventilation, this process may be performed four times a day for at least four months with positive advantage to the animals. When this system had been efficiently carried out—and it has been largely tried by his friends—no case of illness, not to say of death, occurred. In Mr. Crookes's report *On the Application of Disinfectants in arresting the Spread of the Cattle-plague*, that able chemist observed that "the value of sulphurous acid in arresting the progress of the cattle-plague has been proved beyond a doubt by the experiments of Dr. Dewar, and my own results entirely confirm his." His experiments in relation to the cattle-plague led Dr. Dewar to the further discovery of the value of sulphur fumigation in other departments of veterinary medicine. Peripneumonia, ringworm, mange, are among the diseases which rapidly disappear under its influence; and in the sudden undefined illnesses known in Scotland as "drows" and "towts," to which most of our domestic animals are liable, sulphurous fumigation, if applied at the outset, rarely fails to cut short the attack.

In medical practice there are three different forms, independently of the sulphites, in which sulphurous acid may be employed—viz.: (1) As the sulphurous acid of the British Pharmacopœia, which contains 9.3 per cent by weight, or about twenty times the volume of sulphurous acid gas dissolved in water; (2) in the form of spray, which escapes from the preceding compound under the action of an apparatus called a spray-producer; and (3) as a gas evolved by sprinkling at intervals small quantities of "flowers of sulphur" on red-hot cinders placed on a common shovel, resting on a stool in the middle of the room, or by burning bisulphide of carbon (*Lancet* for 1876, vol. ii, pp. 712, 811). A mixture of equal parts of sulphurous acid and water has been recommended in all cases of "breaches of the skin," as primary wounds (whether resulting from injuries or surgical operations), in ulcers, burns, bed-sores, chapped hands, chilblains, saddle-sores (whether of man or beast), sore nipples, and in cases of bruises, such as black eye, etc. Moreover, in erysipelas, its soothing properties, if diluted with two or three parts of water, are very striking. According to Dr. Dewar, the feverish irritability of young children is speedily relieved by dropping from time to time a few minims (5 to 30, according to age) of the acid on a few folds of muslin fastened on the breast: here, however, the action is not local, but is due to the evolution of the gas which is inhaled. Amongst the cases in which the acid is serviceable when applied in the form of spray or inhaled as gas, are asthma, bronchitis, catarrh, croup, diphtheria, facial neuralgia, aryngeal affections, phthisis (at all events as a palliative), scarlatina, and typhoid. Dr. Dewar ascribes the healing action of sulphurous acid to its power of destroying fungi. That the acid has this power, we freely admit, but we cannot so readily admit the correctness of his view that all the diseases in which he has found it serviceable (including piles and chilblains) are dependent on fungous growths. Dr. Dewar reports a case of severe sciatica, in which immediate and perfect relief was afforded by the injection of an ounce of sulphurous acid in a breakfast-cupful of gruel into the rectum. There is one affection of this class, to which Dr. Dewar does not refer, in which it has been prescribed with advantage—viz., the form of gastric disorder in which *sarcina ventriculi* (q.v.) occurs in the vomited matter, the dose being half a dram, largely diluted with water.

None of the *sulphites* or *hyposulphites* have as yet been introduced into the Pharmacopœia. We notice them here because their action is supposed to depend upon the liberation of sulphurous or hypo-sulphurous acid when the salt comes in contact with the acid juices of the stomach. It is mainly to Dr. Polli that we are indebted for the introduction of the sulphites and hyposulphites of the alkalies and alkaline earths (soda, potash, and magnesia) into medicine. From the year 1857 to the present time he has devoted almost all his time to the study of these agents. His labors are briefly summed up as follows by Dr. Sanson in an excellent memoir on "The Germs of Cholera, and the Means of their Destruction," published Jan. 22, 1863, in the *Medical Press and Circular*: "It was found that animals could, without any apparent ill effects, swallow and absorb large doses of the sulphites. It was then observed that when the animals were killed, they long resisted the putrefactive process. Another series of experiments—and in this series 300 dogs were the basis of the deductions—showed that the sulphites exerted a prophylactic and curative power when septic poisons were introduced into the economy. Then, as regards the human subject, it was found that the stomach would tolerate large doses of the sulphites of soda or magnesia. They were tried in the various eruptive fevers, intermittent, diphtheria, typhus, typhoid, cholera, and choleraic diarrhea, pyæmia, puerperal fever, dissection wounds, malarial infection, etc. The records of cases treated in this way show an extraordinary amount of success." In a paper published by Dr. Polli himself in *The British Medical Journal* for Nov. 16, 1867, he states that since the promulgation, in 1861, of his views regarding the therapeutic value of the sulphites, no less than 158 papers on the subject have appeared; and with the exception of five or six containing certain criticisms on his labors, "all the remainder confirm, in the strongest terms, by many hundreds of detailed observations, the value of these remedies." A scruple of the salt dissolved in a wine-glassful of water flavored with tincture of orange-peel is the average dose, and it should be taken every four hours; and in some cases, as in typhoid, a grain of quinine may be advantageously added to each dose. M. de

Ricei (*Dublin Quarterly Journal*, Nov., 1866) prefers the sulphite of magnesia on the grounds that it is less unpalatable, and contains a larger proportional quantity of acid, than the soda salt. He predicts (and Dr. Sanson and other physicians of repute agree with him) that eventually the treatment of zymotic diseases by the administration of the sulphites will be as fully recognized as that of ague by cinchona.

In consequence of the powerful antiseptic properties of sulphurous acid, either in the form of gas or gaseous solution in water, and of the sulphites, these substances have been employed for the purpose of preserving meat from putrefaction. A joint of meat or a fowl submitted to a daily sulphur fumigation may be kept fit for use for many weeks. The bisulphite of lime has been found to be the most applicable of the various compounds of this class as a preservative; and Messrs. Medlock and Bailey have patented a method of preserving meat by means of a preparation of this salt. In hot weather a few drops of a strong solution of this salt will serve to keep fresh a pint of soup, jelly, milk, etc. Dr. Dewar patented a method of preserving meats by sulphurous acid, or some of its compounds; but as yet the process has not come into extensive use.

SULPICIANS, a society of priests formed in 1641 by Jean Jacques Olier for the purpose of educating priests, and deriving its name from the parish of St. Sulpice in Paris, of which he was pastor a year later. When their number had increased, a part assisted the pastor, and others took charge of a seminary. The priests of this society have conducted seminaries in France and some in America. Their institutions in France were suspended in the revolution, but in 1816 restored. Some of their members, as Olier, J. A. Emery, and Carrière have been distinguished as theologians.

SULTAN, or **SULTAN**, an Arabic word, signifying "mighty man," and evidently closely connected with the Hebrew word *shalal*, to rule, is in the east an ordinary title of Mohammedan princes, and also used in private life as a title of courtesy for people of high rank. It is given, *par excellence*, to the ruler of Turkey, who assumes the title sultan-es-selatin, or sultan of sultans. It is also applied to his mother and daughters; the word in Turkish having no grammatical gender, and corresponding also to our princess. The wife of the sultan is not now entitled to the epithet sultan or sultana.

SULU ISLANDS, an archipelago of above 60 islands in the Mindoro sea, between the Philippines and Borneo (q.v.). Cagayan Sulu, the chief of the islands, 36 m. long and 12 broad, contains the town of Soong, the residence of the sultan of the group. See **PHILIPPINE ISLANDS**.

SUMACH, *Rhus*, a genus of small trees and shrubs, of the natural order *anacardiaceæ*; having small inconspicuous flowers in panicles or in corymbs; a 5-parted calyx, 5 petals, springing from beneath a large orbicular disk; 5 stamens; a 1-celled germen with 3 stigmas; the fruit a small, nearly dry drupe, with bony *putamen*. The species are numerous, diffused over almost all parts of the world, except its coldest regions and Australia; and some of them, on account of peculiar principles which they contain, are of importance in the arts and in medicine; some are remarkable for their poisonous properties.—**VENETIAN SUMACH** (*R. cotinus*), known also as wig sumach or wig tree, is a native of the s. of Europe and w. of Asia, and is often planted in Britain as an ornamental shrub. It has simple leaves, and hairy corymbs of fruit, which have a sort of resemblance to periwigs. The wood dyes yellow; and, with the addition of other substances, green and brown, and is known in trade by the name of *young fustic*. It is largely imported into Britain. The bark is sometimes used as a substitute for Peruvian bark. The leaves are astringent, and are used for dyeing Turkey red. The root is also used in dyeing, and the whole plant is used in Italy for tanning, and is there called *scotino*. The seed resembles the almond in flavor.—The very acid fruit of the **ELM-LEAVED SUMACH** (*R. coriaria*)—a native of the countries around the Mediterranean, with pinnate leaves, not unfrequent in British shrubberies—has been used from the earliest times, as it still is by the Turks and Persians, as a condiment with different kinds of food. Both the seeds and the leaves are used medicinally, in the s. of Europe and the e. as tonic and cooling. This species is also extensively used for tanning, particularly in Turkey and in Spain. The leaves and twigs are used for dyeing black, the roots and fruit for dyeing red, and the bark for dyeing yellow.—Similar to this in its properties and uses is the **VIRGINIAN SUMACH**, or **SAG'S-HORN SUMACH** (*R. typhina*), a native of almost all parts of North America, and common in British shrubberies, which has the branches curiously crooked, and covered, when young, with a soft velvety down. It has pinnate leaves, with numerous leaflets.—The **SMOOTH-LEAVED SUMACH** (*R. glabra*), a very similar species, also North American, has very acid leaves, which are eaten by children, and are used in domestic economy and in medicine on account of the malic acid which they contain. The bloom of the fruit is also very acid. This species is sometimes troublesome in North America, overrunning ground as a weed.—Of the acid and poisonous species, the most important is the **POISON OAK** (*R. toxicodendron*) of North America, a shrub from 1 to 3 ft. high, with leaves of 3 leaflets, and a milky juice, which becomes black on exposure to air. The leaves are used in medicine in cases of paralysis, amaurosis, and other nervous affections, as a stimulant of the nervous system, also in chronic rheumatism and obstinate eruptions; but are efficacious only when fresh, as the poisonous substance is volatile. Similar to this in properties are the **POISON IVY**, or **POISON VINE** (*R. radicans*), the **POISON ALDER**, **POISON SUMACH**, or **SWAMP SUMACH** (*R. venenata*), also known as dog-

wood, and other North American species, the juice of which is very acrid, and even the emanations are injurious to some persons, who from remaining a short time near these plants, or from handling them, experience swelling of the whole body, with subsequent inflammation of the skin, pustules, and violent itching, while it is remarkable that others appear quite unsusceptible of their influence.—The VARNISH SUMACH or JAPAN VARNISH TREE (*R. vernicifera*), a native of Japan and Nepal, yields a varnish much used in Japan for lacquer-work. This varnish is the juice which flows from wounds in the tree, and which becomes thick and black by exposure to the air, but is still so transparent that the finest veins of wood varnished with it may be seen through it. It is sometimes mixed with coloring matters, sometimes with gold-leaf finely ground. The expressed oil of the seeds becomes as hard as tallow, and is used for candles.

The name TANNERS' SUMACH is given to *coriaria myrtifolia*, a shrub of the s. of Europe, of the natural order *ochnaceæ*. The leaves are astringent, and are used for tanning, and for dyeing black.

SUMAT'RA (called by the Arabians *Srimat* or *Srimata*, "the happy," whence its present name), the most westerly of the Sunda islands, lies s. of the Malay peninsula, from which it is separated by the strait of Malacca. Lat. between 5° 45' n. and 5° 50' south. It is 1040 m. long and 266 m. in extreme breadth; area, 168,000 sq m.; pop. including that of the adjacent isles, 5,000,000, about two-thirds of whom are directly or indirectly under Netherlands rule. The Europeans in 1873 numbered 2,654, not including the army in Atcheen.

Physical Features.—The Barisan mountains run throughout its entire length, varying in altitude from 1550 ft. in the s.w. to 6,000 under the equator. Lofty cones, of which about 20 are volcanoes, attain to from 6,000 to upward of 10,000 feet. Another series of mountains runs parallel with the Barisan, lofty plateaux of great extent linking them together at various points. On the w. coast, a few m. of low land lie between the mountains and the sea, in some parts spurs reaching the shore in beetling cliffs. Wide alluvial plains, covered with dense jungle and forest, through which the rivers run sluggishly, forming deltas at their mouths, stretch along the e. coast; while the tidal action is eating into the w. coast, new ground is forming on the east.

Extensive valleys lie between the mountain chains. Several beautiful lakes are scattered over the interior. The largest is lake Singkarah or Samawang, in upper Padang, 17 m. long and 6 broad. It is 1167 ft. above the sea, and discharges its waters by the Ombih, which flowing toward the e. coast, becomes the Indragiri.

The mountain systems are of trachyte, granite, limestone, red sandstone, and a widespread conglomerate composed of granitic and quartzose particles, the hollows in many places being filled with lava. Sienite, porphyry, serpentine, jasper, basalt, and tufa occur. Tertiary deposits are found in the valleys, and in some parts of the coasts a rich vegetable mold rests on beds of red and gray clay, or on coralline limestone. Potter's clays are met with, and gold is widely diffused. Coal, iron-ore, copper, sulphur, lead, silver, saltpeter, alum, naphtha, etc., abound.

Rivers.—Sumatra has many rivers, the most important being the Tulang-Bawang; the Masi, or river of Palembang; the Djambi, Indragiri, and Siak, on the e.; the Singkel, Tabjong, Indraputra, Moko-Moko, Bencoolen, and Padang Gadjie on the west. The capes and bays are numerous, the bay of Tapanuli being capable of containing a large fleet. A chain of islands lies parallel to Sumatra in the Indian sea. The most important are—Babi or Si Malu, Nias (q.v.), the Batû islands, North Pora, Coco island, South Pora, North Pagei, and South Pagei. To the s.e. lies Banca, rich in tin, producing also iron, lead, silver, copper, arsenic, and amber.

Climate.—The climate of Sumatra is moderately healthy, especially on the e. coast. In Tapanuli, however, are large marshes, inducing intermittent and typhoidal fevers, dysentery, and other diseases. A slight increase of temperature takes place from October to March, the minimum being in May. Except in the highlands of the interior, where it is cool, the thermometer ranges from 70° Fahr., at sunrise, to 94° at 2 p.m. The monsoons are irregular, and rain falls during all the months, though the quantity in October and December is double that in February and June.

Flora.—Sumatra has many fine species of timber trees—as the djati (*tectona grandis*), the maris, a hard and heavy wood, ebony, iron-wood, etc. The magnificent *dryobalanops camphora*, and other resin-producing trees, are abundant. Several species of fig, the *urceola elastica*, from which caoutchouc is obtained, and the gutta-percha tree (*isonandra gutta*), are numerous. In the villages the bombax, or silk-cotton tree, forms a shady resting-place at noon. The lovely *cinnamomum cassia*, the *melaleuca leucaden-dron*, which yields the medicinal cajuput oil, the satin-wood (*chloroxylon srietenian*), the gigantic reed (*calamus draco*), from the ripe fruit of which the dragon-blood gum exudes, and a great variety of palms, form part of the botanical wealth of the island. Flowering plants and shrubs are numerous, and countless parasites garland the forest trees with flowers of every hue. The most curious of these is the *rafflesia* (q.v.), which, clinging to the bark of large trees, spreads out the largest known flower, with a calyx 3 ft. in diameter and 9 in. deep, and capable of containing 2 gallons of fluid.

The fruits are richer in flavor than those of Java. Among these are the guava, citron, oranges, lemon, durian, mango, bread-fruit, cocoa-nut, pomegranate, water-

melons, pine-apples, and the highly-prized mangosteen, or berry of *garcinia mangostana*. Cacao, cotton, maize, indigo, tobacco, gambier, and more especially rice, millet, pepper, and coffee, are cultivated.

Fauna.—The elephant, single and double horned rhinoceros, tiger, leopard, black bear, and tiger-cat, wild-swine, tapirs, antelopes, deer, monkeys (including the ourang-outang), ant-eaters, many kinds of bat, etc., abound. Buffaloes, cows, goats, horses, sheep, and swine are kept by the natives. The peacock and the pheasants of Sumatra are of rare beauty. Hippopotami and crocodiles frequent the rivers, which have many kinds of fish, including a species of salmon.

Geographical and Political Divisions.—The kingdom of Acheen extends from the n.w. point to 98° 16' e. long., and on the e. coast at Tamiang, to 4° 22' n. lat., on the w. to 2° 22' n. lat.; area, 18,900 sq. m.; pop. about 400,000. The Dutch troops now have a strong position in the country, and will probably subdue the whole. It is well cultivated, and produces much pepper. Singkel, Tapanūli, and Lower Padang, administratively under the presidency of Padang, lie in succession to the s.e. of Acheen. Bencoolen stretches along the w. coast from 101° to 104° 40' e. long.; and the extreme s. and the e. coast, between 4° 4' and 5° 56' s. lat., form the Lampung districts. North of these is the residency of Palembang, with the kingdom of Djambi, ruled over by a native prince under Dutch control. Further n. are Indragiri, Kampar, and Siak, governed as Djambi. Between Siak and Acheen are many petty states.

People.—The natives are chiefly Malays who profess Mohammedanism. In appearance, manners, and customs, however, the inhabitants of Acheen and the Lampongs differ widely from those of other parts. The Acheenese are tall, well-made, active, and intelligent, but cunning, proud, treacherous, and blood-thirsty. They live simply, but are slaves to opium. The Lampongers are of middle stature, well-formed, of pleasant exterior, mild, but uncivilized and lazy. Caste prevails, and they follow the usages of their fathers, Mohammedanism being imperfectly known and practiced. Polygamy obtains, the wives being bought from their relatives. The houses are on posts of iron-wood, several families living under the same roof. In other parts of Sumatra the usual Malay type is found. The Kūbūs, in the n.w. of Palembang, are probably the remains of the aborigines, a harmless race who live chiefly by the chase and fishing. Theft and murder are scarcely known among them. They believe in an after spirit-life.

Trade and Produce.—The imports and exports of the independent and half-independent kingdoms cannot be ascertained. Acheen alone produces 8,000 tons of pepper annually, and also exports gold, precious stones, cotton, raw silk, sapan wood, benzoin, camphor, sulphur, betel, etc., to the w. of India by way of Pūlu, Penang, and Singapore, receiving in return manufactured goods, salt, opium, etc. On the s.w. coast, Bencoolen, the Lampongs, and Palembang, the imports have an annual value of about £750,000; the exports to £850,000. Java has nearly half the trade, Europe and eastern countries the remainder. Imports—rice, cotton, and other textile fabrics, etc.; exports—benzoin, gum elastic, resin, pepper, rattans, cotton, coffee, drugs, ivory, dye-stuffs, edible nests, wax, tobacco, bêche-de mer, etc. The rice-culture is extensive, the w. coast producing as much as 320,000 tons in a single year. The coffee yield varies from 5,500 tons to nearly twice as much. Upper Padang sends the largest quantity of coffee and rice, with much cocoa-nut oil, to market.

History.—Marco Polo visited Sumatra in the 13th c. Alvaro Tal-zo in 1506, and Siquera in 1509, the Portuguese then entering into trading relations with the natives. About 90 years later the Dutch under Houman reached the island, and on a second visit he was treacherously murdered at Acheen. In 1601 two ships from Zealand, with the Netherlands commissioners, gen. De Roi and Laurens Bikker, arrived; were favorably received by the king, obtained a full cargo, and returned with two Acheenese ambassadors. Later, the Dutch drove the Portuguese from their factory at Pūlu Tjinko, to the s. of Padang; and in 1666 the latter place became the seat of the Netherlands power on the w. coast. In 1795 Padang was taken by the British, and retained till 1819. A few years after, Bencoolen was also given up to the Dutch, and the southern division of the island soon fell under the same rule. Various rebellions against the Netherlands dominion have since arisen, with the uniform result of extending the power of the Dutch toward the interior and the north. In 1865 an expedition was sent to force the king of Asahan, a small state on the n.e. coast, to submit to their authority, and since 1872 they have been waging war against Acheen.—See *Flora van Nederlandsch Indië*, door F. A. W. Miquel (Amst. and Leip. 1855); *Bijdragen tot de Geologische en Mineralogische kennis van Ned. Indië, in het Natuurk. Tijdschr. v. N. I. passim*.

SUMBAWA, one of the chain of islands to the e. of Java, lies between 8° 4' and 9° 2' s. lat., and 116° 50' to 119° 15' e. long., is now divided into the kingdoms of Sumbawa, Bina, Dompo, and Sangar, each governed by its own sovereign. Area, 5,838 sq. miles. Pop. nearly 100,000. The island is mountainous, but except the volcano Tambora, which is 9,522 ft., the elevation does not exceed 5,660. The most valuable timber-tree is the djati (*tectona grandis*, or Indian teak), and the tamarind is so abundant as to be little valued. Rice is extensively grown. Sapan wood is contracted for with the princes, by the Netherlands colonial government.

The natives of Sumbawa belong to the Malay race, but speak three different lan-

guages. They are inoffensive and industrious, murder, robbery, and theft being almost unknown. Many of them are Mohammedan, but the mountaineers are chiefly heathen, with an idea of a supreme being. Ancient relics recently found in Bima, indicate that they were formerly professors of Hinduism.

In 1815 an eruption of Tambora depopulated the kingdoms of Tambora and Papekat, 12,000 lives being lost, and great damage done to the whole island by the ashes. Another took place in 1836, and one of Gunong Api, in Bima, in 1860, but with little loss.

SUMBUL (see MUSK PLANT) has been extensively employed for some years past, both in this country and in America, in the treatment of epilepsy, hysteria, and other diseases of the nervous system. It has a musk-like odor, and an aromatic and somewhat bitter taste. It may be given in the form of infusion, tincture, or resin.

SUMMARY DILIGENCE, in the practice of the law of Scotland, means issuing execution without the formality of an action, as a creditor enforcing payment of a bill of exchange or of a bond.

SUMMER, a horizontal beam, called also breast summer.

SUMMER DUCK, or **WOOD DUCK**. *Dendrocygna sponsa*, or *aix sponsa*, a very beautiful species of duck, of the section having the hind-toe destitute of membrane, a native of North America. It is found during the breeding season in almost all parts of the United States, and as far n. as Nova Scotia, migrating southward in winter, when it abounds in Texas and Mexico, but some remain during winter even in Massachusetts. It has been found capable of domestication.—Very similar to it is the **MANDARIN DUCK** (*dendrocygna* or *aix galericulata*), a Chinese species. Both of these species have the power of perching on trees. The summer duck makes its nest in the hollow of a tree.

SUMMERFIELD, JOHN, 1798–1825; b. England; educated at the Fairfield Moravian seminary; was a clerk at 14 in a mercantile house in Liverpool, and fell into bad habits; went with the family to Dublin in 1813; joined the Wesleyans; became a preacher in the Irish conference, 1818; preached with eloquence and success in Ireland and England; came to America with his father, 1820, and joined the New York conference. In New York, Philadelphia, Baltimore, and Washington, his remarkable eloquence drew immense crowds from all denominations, classes, and professions. His health failing under his excessive labors he sailed for France in 1822; represented in Paris the American Bible society to the French Protestant Bible society; spent some time in England; returned to New York, 1824, and continued to travel and preach, though in feeble health. He aided in forming the American tract society. His *Sermons* and *Sketches of Sermons* were published, with a biography by John Holland.

SUMMER ISLANDS, a small archipelago of islets off the w. coast of Scotland, near the entrance of Loch Broom, an inlet in the n.w. of the county of Ross. The islets are about 20 in number; and the largest of them, Tanera, 2 m. long, and 1 m. broad, has a pop. 71, of 114.

SUMMERS, a co. in s. West Virginia, drained by the Greenbrier and Kanawha rivers and traversed by the Chesapeake and Ohio railroad; formed a few years ago from Nicholas co.; pop. '80, 8,832—8,765 of American birth, 693 colored. The surface is rough and hilly, fertile only in the bottom lands; corn, wheat, and cattle are the staples. Co. seat, Hinton.

SUMMERS, THOMAS OSMOND, D.D., LL.D., b. England, 1812; came to America, 1830; joined the Methodist Episcopal church, 1832; received into the Baltimore conference, 1835; missionary to the republic of Texas, 1840, and was one of the nine preachers who formed the first Texas conference; became a member of the Alabama conference, 1844; was secretary of the conference at Louisville, Ky., where the Methodist Episcopal church, South, was organized. He has published *A Treatise on Baptism*; *A Treatise on Holiness*; *Sunday-school Teacher, or the Catechetical Office*; *Seasons, Months, and Days*; *Talks Pleasant and Profitable*; *The Golden Censer*; *Scripture Catechism*, 2 vols.; *Questions on Genesis*; *Refutation of the Theological Works of Thomas Paine*. He was appointed in 1846 assistant editor of *The Southern Christian Advocate*; edited *The Sunday-school Visitor* for seven years, and *The Quarterly Review* of the Methodist Episcopal church, South, in 1858; was chairman of the committee appointed to prepare the new hymn book, and has edited nearly all the publications of the Southern Methodist church.

SUMMIT, a co. in n.w. Colorado, bordering on Utah, crossed by the Rocky mountains; 8,500 sq. m.; pop. '80, 5,459. There are large deposits of gold, iron, coal, lead, copper, and zinc. Co. seat, Breckinridge.

SUMMIT, a co. in n.e. Ohio, drained by the head-waters of Tuscarawas river and the Cuyahoga; 420 sq. m.; pop. '80, 43,788—36,724 of American birth, 377 colored. It is intersected by the Ohio canal, here at its highest elevation, and by the Atlantic and Great Western, the Cleveland and Pittsburg, and the Cleveland, Mt. Vernon and Columbus railroads. Its surface is hilly, diversified by lakes, and contains the long narrow valley of the Cuyahoga, 300 ft. deep. The streams furnish extensive water-power; there is a good supply of timber; rich coal beds are mined; there are sandstone, and fire clay. Large numbers of sheep and other stock are raised, and the soil produces grain, and

dairy products. The manufactures are important, embracing carriages, cooperage, lumber, leather, cutlery, and edged tools, machinery, paper, iron castings, etc. Co. seat, Akron.

SUMMIT, a co. in n.e. Utah, bordering on Wyoming; crossed by the Walsatch mountains, which rise here to a height of 12,000 ft.; 1250 sq. m.; pop. '80, 4,240. The surface is covered with vast forests. It has large deposits of gold, silver, lead, and coal. Co. seat, Coalville.

SUMMONS, in English law, means generally a writ directed to a party to appear and answer some complaint before a court or judge. It is the first writ in an action at law; and a similar writ issues incidentally both in chancery and interlocutory matters. It is also the first step in proceedings before justices. In Scotland, it is also the first writ in an action.

SUMNER, a co. in s. Kansas, having the territorial line of the Indian territory for its s. boundary; 1188 sq. m.; pop. '80, 20,812—19,589 of American birth, 114 colored. It is drained by Arkansas river, Good river, and Cowskin and Slate creeks. The surface is level prairie, containing every element of fertility. Co. seat, Wellington.

SUMNER, a co. in n. central Mississippi, drained by the Big Black river; about 400 sq. m.; pop. '80, 9,535—2,297 colored. The surface is rolling and heavily wooded. The soil is fertile. Corn, cotton, and potatoes are the principal productions. Co. seat, Walthall.

SUMNER, a co. in n. central Tennessee, adjoining Kentucky; drained by branches of the Big Barren and Cumberland, by which it is bounded s.; traversed by the Louisville and Nashville railroads; 500 sq. m.; pop. '80, 23,625—23,510 of American birth; 7,331 colored. The surface is heavily wooded and elsewhere fertile; tobacco, corn, wheat, oats, and pork, are the staples. Co. seat, Gallatin.

SUMNER, CHARLES, American statesman, was born at Boston, Mass., Jan. 6, 1811. His father was a lawyer, and for many years sheriff of the county. He was educated at Harvard college, where he graduated in 1830; studied law at the Cambridge law school; was admitted to the bar in 1834, and entered upon a large practice; edited the *American Jurist*; published three volumes of *Sumner's Reports of the Circuit Court of the United States*; gave lectures at the law school, but declined a proffered professorship; and from 1837 to 1840, visited England and the continent of Europe. On his return he edited Vesey's *Reports*, in 20 vols., and in 1845, made his *début* in politics in a 4th of July oration, on the true grandeur of nations—an oration against war and the war with Mexico, pronounced by Mr. Cobden the noblest contribution by any modern writer to the cause of peace. Identifying himself with the free-soil party, he was, in 1850, chosen U. S. senator from Massachusetts, in place of Daniel Webster, where he opposed the fugitive slave law, and declared "freedom national—slavery sectional." In 1856 he made a two days speech on "the crime against Kansas," some of which was of a violently personal character, in consequence of which he was attacked in the senate chamber, May 22, and severely beaten by Preston C. Brooks, and so severely injured that his labors were suspended for three or four years; during which he visited Europe for repose and health. Returning to the senate, he supported the election of Mr. Lincoln, urged upon him the proclamation of emancipation, and became the leader of the senate, as chairman of the committee on foreign relations. In 1862 he was again elected a senator, and re-elected in 1869. In 1871 he opposed the annexation of Hayti to the United States. He published *White Slavery in the Barbary States* (1853); *Orations and Speeches* (1850), etc. He died in 1874. A *Memoir and Letters* appeared in 1878.

SUMNER, CHARLES (cont.). A man of great personal force and indomitable will, Mr. Sumner made his influence more distinctly felt by the American people, and more directly influenced the course of events by his personal action, than did most of his associates in the senate. Frequently on the unpopular side of important questions, he often succeeded in turning the popular mind in the direction of his own opinion, by the force of the reasoning which he brought to bear on the question at issue. Such was peculiarly the case with regard to the Mason and Slidell affair; the emancipation act; and the St. Domingo question. His oratorical efforts were invariably the result of exhaustive labor, and to the last he methodically wrote out his addresses. From the beginning of the war of the rebellion, he insisted upon the abolition of slavery; and favored the largest possible freedom of action, political and social, for the negro. His antagonism to pres. Grant's St. Domingo policy was positive and continuous; and he became so imbittered against the administration that he opposed Grant's re-election, and supported Horace Greeley in 1872. The antagonism was mutual, Mr. Sumner's friend, Mr. Motley, having been removed from the position of minister to the court of St. James in 1870; while he himself was forced out of the position of chairman of the important committee on foreign affairs in 1871, a position which he had held continuously for ten years. His last important act was to press his civil rights' bill, which placed the negro on a perfect equality with the whites in every state in the union, so far as personal rights under the law were concerned. He never recovered, it was thought, from the effects of the attack made upon him by Mr. Brooks in 1856; and in 1874 this trouble returned

to him in a serious malady of the chest, which proved fatal to him on Mar. 11 of that year.

SUMNER, EDWIN VOSE, 1796-1863; b. Boston; appointed to the army in 1819; served in the Black Hawk war on the Indian frontier, and through the Mexican war. He was dangerously wounded at Cerro Gordo, where he led the charge, and was brevetted colonel for his conduct at Molino del Rey, where he was in command of the cavalry. He was governor of New Mexico, 1851-53; led an expedition against the Cheyennes in 1857; and in 1861 succeeded Twiggs as brig.gen., and assumed command of the department of the Pacific. He was soon recalled to the e., and taking command of the 1st corps of the army of the Potomac, served through the peninsular campaign of 1862, in which he was twice wounded. The same year he became maj.gen. of volunteers, and took command of the 2d corps. He was at Fredericksburg, and early in the next year was ordered to take command of the department of the Missouri, but died on his way.

SUMNER, JOHN BIRD, D.D., 1780-1862; b. England; educated at Eton and Cambridge; ordained and appointed canon of Durham, 1820; bishop of Chester, 1828. In this district he gave a great impetus to the building of churches and the establishment of schools. In 1848 he was consecrated archbishop of Canterbury. He was a liberal in politics, and the leader of the evangelical portion of the English church. He published essays on the prophecies and on Christian evidences; the Hulse prize essay; *The Records of Creation*, which received the Burnett prize of \$400; besides several volumes of sermons and charges. His numerous theological works are distinguished "by their earnest piety, depth of thought, and elegance of language."

SUMPTUARY LAWS (Lat. *sumptus*, expense), laws passed to prevent extravagance in banquets, dress, and private expenditure. They abound in ancient legislation. The Locrian legislator, Zaleucus, 450 B.C., ordained that no woman should appear in the streets attended by more than one maid servant, unless she were drunk, or wear gold or embroidered apparel, unless she designed to act unchastely. At an early period in Roman history, the censors, to whom was intrusted the superintendence of public and private morality, punished with the *notatio censoria* all persons guilty of luxurious living; but as the love of luxury grew with the increase of wealth and foreign conquest, various legislative enactments were passed with the object of restraining it. The lex Orchia, 161 B.C., limited the number of guests to be present at a feast; the lex Fannia, 161 B.C., regulated the cost of entertainments, enacting that the utmost sum which should be expended on certain festivals was to be 100 asses, 30 asses on certain other festivals, and 10 asses on an ordinary entertainment, where also no other fowl than one hen was permitted to be served up, and that not fattened for the purpose. There were also the lex Didia, Lucretia, Cornelia, Æmilia, Antia, Julia, and others, most of them passed in consequence of the practical disregard of the similar laws that had preceded them; but they all seem to have been habitually transgressed in the later times of the republic.

Sumptuary laws were in great favor in the legislation of England from the time of Edward III. down to the reformation. Statute 10 Edward III., c. 3, narrates that "through the excessive and over-many costly meats which the people of this realm have used more than elsewhere, many mischiefs have happened; for the great men by these excesses have been sore grieved, and the lesser people, who only endeavor to imitate the great ones in such sorts of meat, are much impoverished, whereby they are not able to aid themselves, nor their liege lord, in time of need, as they ought, and many other evils have happened as well to their souls as their bodies;" and enacts that no man, of whatever condition or estate, shall be allowed more than two courses at dinner or supper, or more than two kinds of food in each course, except on the principal festivals of the year, when three courses at the utmost are to be allowed. All who did not enjoy a free estate of £100 per annum were prohibited from wearing furs, skins, or silk, and the use of foreign cloth was allowed to the royal family alone. Act 37 Edward III. declares that the outrageous and excessive apparel of divers people against their estate and degree is the destruction and impoverishment of the land, and prescribes the apparel of the various classes into which it distributes the people; it goes no higher than knights, but there are minute regulations for the clothing of women and children. This statute, however, was repealed the next year. In France there were sumptuary laws as old as Charlemagne, prohibiting or taxing the use of furs; but the first extensive attempt to restrict extravagance in dress was under Philip IV. By an edict of Charles VI. no one was allowed to exceed a soup and two dishes at dinner. Sumptuary laws continued to be introduced in England in the 16th, and in France as late as the 17th century. Scotland had also a similar class of statutes. The Scottish parliament attempted to regulate the dress of the ladies, to save the purses of the "puir gentlemen, their husbands and fathers." There was a prohibition against their coming to kirk or market with the face muffled in a veil; and statutes were passed against superfluous banqueting, and the inordinate use of foreign spices "brocht from the pairts beyond sea, and sould at dear prices to monie folk that are very unabill to sustain that coaste." Neither in England, Scotland, nor France do these laws appear to have been practically observed to any great extent; in fact, the kings of France and England contributed far more, by their

love of pageantry, to excite a taste for luxury among their subjects than by their ordinances to repress it. Mr. Froude suggests that such statutes may have been regarded, at the time when they were issued, rather as authoritative declarations of what wise and good men considered right, than as laws to which obedience could be enforced. Enactments of this kind have long been considered to be opposed to the principles of political economy. Most of the English sumptuary laws were repealed by 1 James I., c. 25, but a few remained on the statute-book as late as 1856.

SUMTER, a co. in w. Alabama, adjoining Mississippi; bounded on the e. by the Tombigbee river, drained by Sucarnoochee creek and the Noxubee river; traversed by the Alabama Central, and the Alabama and Chattanooga railroads; about 860 sq.m.; pop. '80, 28,728—22,280 colored. The surface is rolling and heavily wooded. The soil is fertile. The principal productions are corn, cotton, and live stock. Co. seat, Livingston.

SUMTER, a co. in e. Florida, 1370 sq.m.; pop. '80, 4,686. The surface is level and partly swampy. Co. seat, Leesburg.

SUMTER, a co. in s.w. Ga., drained by the Flint river, its e. boundary, and by several creeks; traversed by the South-western railroad, about 600 sq.m.; pop. '80, 18,239—18,192 of American birth, 12,189 colored. The soil is level and fertile; cotton, corn, and pork are the chief productions. Co. seat, Americus.

SUMTER, a co. in e. central S. C., drained by the Wateree and Black rivers and Lynch's creek; traversed by the Wilmington Columbia and Augusta railroad; about 600 sq.m.; pop. '80, 37,037—36,926 of American birth, 27,064 colored. Surface level and extensively covered with pine forest, the tar and turpentine from which are, with cotton, the main exports. Co. seat, Sumter Court-House.

SUMTER, Fort (originally spelled *Sumpter*, after gen. Sumpter, in whose honor it was named), an American fort of the second class, built 1845-55, in the form of a truncated pentagon 50 ft. high, on an artificial island, at the entrance of Charleston harbor, 2½ m. distant from forts Moultrie and Pinckney, on either side. On the secession of South Carolina, Dec., 1860, maj. Anderson, in command of the defenses of the harbor, was called upon to surrender them to the state authorities. Instead of doing this, he abandoned the other forts and occupied fort Sumter, mounting 52 guns, with a garrison of 70 men and 30 or 40 workmen. This was considered an act of war by the confederates and their troops, who, under command of gen. Beauregard, took possession of forts Pinckney and Moultrie, and erected additional batteries. While the surrender of the fort was under consideration, a fleet was sent from New York for its relief. On its appearance off the harbor, the attack on the fort was opened by gen. Beauregard, April 12, 1861, and it surrendered on the 13th. This event aroused the north, and began the war, which terminated in 1865. During the siege of Charleston this fort was battered by the heaviest artillery, until its walls were completely crushed and shattered. The flag-staff was shot away fifty times, and thousands of tons of iron projectiles were mingled with the debris of the fort; but the garrison constructed a still stronger fortress on its ruins, and held it for three years against assault and bombardment, until the operations of gen. Sherman compelled its evacuation, and the United States flag was again raised, April 14, 1865; an event soon followed by the evacuation of Richmond, and the surrender of all the confederate armies.

SUMTER, THOMAS, 1734-1832, h. Va.; settled in South Carolina. He took part in the Cherokee war, and was prominent in the political movements which resulted in the revolution. He became col. of the 2nd regiment of riflemen in 1776, and remained in the state till the surrender of Charleston, when he enlisted a considerable force in North Carolina, and defeated a body of British and Tories. Soon afterward he unsuccessfully attacked the post at Rocky Mount. Within a few days he defeated the prince of Wales regiment at Hanging Rock and dispersed a large force of Tories. Routed in his turn by Tarleton at Fishing creek, he recruited another force with which he beat Tarleton at Blackstocks, but was dangerously wounded. He was made brig. gen. of the S. C. militia, and was thanked by congress. In 1781 he enlisted 3 regiments of rangers and aided Marion and other generals. He sat in the convention which formed the federal constitution; was a member of congress, 1789-93, and 1797-1802, and was U. S. senator, 1801-10. He was U. S. minister to Brazil, 1810-11.

SUMY, a t. of Russia, in the government of Kharkov, and 90 m. n.w. of the town of that name, on the Psol. It contains several factories, and has an important annual fair. Pop. '67, 14,060.

SUN, THE, the great luminary upon which not only our well-being but our very existence depends, has been from the earliest ages a source of wonder and admiration, and its worship was probably the very first form of idolatry. See SUN-WORSHIP.

When the true system of the universe became known, one of the first labors of astronomers was to ascertain the distance and size of the sun, and these have been known for some time with tolerable precision; but until lately the most vague and unsatisfactory theories regarding its chemical and physical constitution have continued to prevail.

Within the last few years, however, our knowledge of its chemical and physical con-

stitution has increased with a rapidity probably unequalled in any other branch of science.

Our knowledge regarding the sun is best arranged under three heads: viz., *The general relations of the sun to our globe; the sun's chemical constitution; and its physical constitution.*

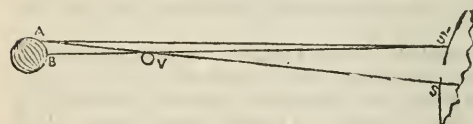
Relations of the Sun to the Earth, as the Source of Light and Heat.—In order to appreciate the grandeur of the scale on which solar activity is carried on, it is only necessary to know a few facts relative to the sun, which are best expressed by numbers.

1. *Distance of the Sun from the Earth.*—The difficulty in ascertaining the parallax (q.v.) of the sun arises from the smallness of the base line as compared with the distance of the object. The distance of the observing stations must always be less than 8,000 m.; from this the parallax of the moon, which is only 30 times 8,000, can be observed directly with tolerable nearness. But when the distance is many thousands times the length of the base line, the triangle is "ill-conditioned" or unfavorable to accuracy, and the problem must be approached indirectly. The first attempt to measure the distance of the sun was that made by the Greek astronomer Aristarchus in the third c. B.C., who made it only about one-twentieth of what we now know it to be. Even the great astronomer Kepler in the seventeenth c. could only say that the distance must be at least between 13 and 14 millions of miles. Subsequent estimates—for, owing to the imperfection of the methods and instruments, they were little better than estimates—rose to 80 millions. At last, in 1716, the English astronomer Halley proposed a method of employing the transits of Venus. Accordingly, the transits of 1761 and 1769, were observed in a variety of places; but the results at first deduced were discordant and unsatisfactory, until in 1824 the German astronomer Encke "discussed" the observations of 1769, and arrived at a distance of about $95\frac{3}{10}$ millions of miles; and this number held its place in books of astronomy for a good many years. In the mean time, in the absence of transits, other methods, become possible through the growing perfection of astronomical instruments, were tried, and most of them concurred in pointing to a value nearly $3\frac{1}{2}$ millions less than that above stated; so that 91,500,000 came to be accepted as the approximate distance of the sun, until the transit of 1874 should settle it more definitely.

A transit can occur only when the planet is in or near one of her nodes at the time of inferior conjunction, so as to be in a line between the earth and the sun. The coincidence of these two conditions follows a rather complex law. There are usually two transits within eight years of one another, and then a lapse of 105 or 122 years, when another couple of transits occur, with eight years between them. The transit of 1874 will be followed by one in 1882, and there will not be another until June, 2,004.

The way in which a transit is turned to account may be understood by the help of the accompanying diagram, where E represents the earth; V, Venus; and S the sun. It is to be premised that the *relative* distances of the planets from the sun are well known. Their periodic times can be observed with accuracy, and from these by Kepler's (q.v.) law we can deduce the *proportions* of the distances, but not the distances themselves. It is thus known that if the distance of the earth from the sun is taken as 100, that of Venus is 72. In the fig. then, AV is 28, or about one-third of Va or Vb.

An observer at a station, A, on the northern part of the earth will see the planet projected on the sun as at *a*, while a southern observer will see it at *b*. The distance of the sun from Venus being about three times her distance from the earth, it is obvious that



the distance *ab* will be three times the distance AB; and it is a great advantage to have the stations A, B, as far apart as possible, as the interval *ab* is thus increased and its measurement rendered more accurate.

But how is it measured? For each observer sees only one of the spots, and does not know where the other is; and

there are no permanent marks on the sun's surface to guide us. The difficulty is got over in the following way: Each observer notes the exact duration of the transit, that is, the time the spot takes to travel from C to D, or from F to G. Now as we know the rate of Venus's motion in her orbit, this gives us the lengths of the lines CD and FG in minutes and seconds of arc. Knowing then the angular diameter of the sun ($32''$) and the lengths of two chords CD and FG, we can easily, by the properties of the circle, find the distance *ab* between them. This gives us the angle *aAb*. In the triangle AVb, then, we know the angle at A and the proportion of the sides AV and Vb, and from that we can find the angle AVb or A**b**B. Now this is the quantity sought, being the parallax of the sun as seen from two stations on the earth. Whatever the distance AB actually is, the angle is reduced to correspond to a distance equal to the earth's semi-diameter. The parallax deduced by Encke, as above referred to, was only $8.5776''$, while the parallax corresponding to the other smaller measurement above stated is $8.94''$. The advantage of this roundabout procedure is that a comparatively large angle (*aAb*) is measured in order to deduce from it a smaller (*A**b**B*), so that any error in the measurement is diminished in the result.

The transit of 1874 was observed at more than fifty stations, astronomers from all the civilized world taking part in the work. The labor of discussing and comparing the observations has not yet been overtaken, but several partial results have been announced,

which still show considerable discrepancy. The chief source of uncertainty arises from the difficulty the observers found in determining the exact moment of "ingress" and "egress" of the planet, owing to the dense atmosphere of the latter rendering the limbs of the two bodies indistinct and distorted. Much was expected from the multitude of photographic pictures taken, but they have proved a failure. They are said to lack the necessary sharpness, and to be liable to other sources of error. The first partial discussion of the British observations gave, according to the astronomer royal, a result of $93\frac{7}{10}$ millions of miles. A more extended discussion since announced results in $92\frac{7}{10}$ millions of miles.

It is hoped that when the transit of 1882 comes, the defects of the photographs, as well as the uncertainty of the time-observations, may be obviated. In the meantime astronomers are turning with greater hope to other methods, especially to observations of Mars, and of some of the minor planets. From observations of Mars made in 1862, the American astronomer Newcomb deduced a distance of $92\frac{7}{10}$ millions of miles. The velocity of light, which has been determined by the ingenious optical experiments of Foucault and others, has also been pressed into the service of the problem. The aberration of light (q.v.) results from the relation of the velocity of light to that of the earth's motion in her orbit; and from the observed amount of the aberration we are thus able to deduce the earth's velocity. From knowing then the time of the earth's revolution, we can find the circumference of her orbit, and hence her distance from the sun. The most careful investigation by this method gives a distance of 93 millions of miles. An ingenious method of observing the parallax of Mars at its opposition, first suggested by the astronomer royal, but carried out by Mr. Gill on the island of Ascension in 1877, promises still more satisfactory results. The essence of the method consists in this, that instead of depending upon two sets of observers at different parts of the earth, one observer and one station are made to suffice. One observation is taken in the evening when the planet is rising, and another in the early morning when it is setting. In the mean time the rotation of the earth has transported the observer 6,000 or 7,000 m. through space, and this forms his base line. Mr. Gill's observations were made by means of the heliometer, the most effective of instruments for such purposes. From such of his observations as had been reduced at the end of 1878, Mr. Gill announces his belief that the sun's distance will prove to be nearer to 93 than to 92 millions of miles.

The other important numerical facts relative to the sun are the following: Its *diameter* calculated on the basis of the shorter distance hitherto received, is, in round numbers, 850,000 m., or more than 107 times the mean diameter of the earth; so that the *volume* or bulk of the sun exceeds that of the earth 1,200,000 times, and is 660 times greater than the bulk of all planets at present known, together. The *mass* of the sun, or quantity of matter it contains as measured by weight, exceeds that of the earth only 300,000 times; and thus it appears that the matter of the sun has only one-fourth the density of that of the earth. From this and other facts, it is inferred that the matter of the sun exists for the most part in a gaseous condition. Still his mass is 740 times greater than the masses of all known planets put together. The *period of rotation* of the sun upon its axis, which Galileo was the first to calculate from observations of the sun-spots, and which takes place in the same direction as that of the earth, is about 25 days 8 hours. It appears, however, that this period varies according to the solar latitude of the spots from which it is calculated. The *inclination* of the axis of the sun to the ecliptic is about $7\frac{1}{2}^\circ$, and the *longitude of the ascending node* is about $74^\circ 30'$.

2. The form or *figure of the sun* has been the subject of recent investigations. The polar and equatorial diameters of the sun's disk as observed, have been supposed to differ, though by a very small quantity only. The photographs of the sun do not quite agree in the amount of the value for the diameter with that given by observations.

The general laws by which the relation of our earth to the sun, as the source of light and heat, is governed, are of the most simple kind. The rays which emanate from the sun's disk into space proceed in diverging lines, and, on arriving at the earth, their intensity will be inversely proportional to the square of the sun's distance. This may be called the primary law; but the more obvious phenomena of solar heat and light are manifested to us under a secondary law depending on the obliquity of incidence of the sun's rays. See CLIMATE, EARTH, TEMPERATURE, etc.

3. *Chemical Constitution of the Sun.*—Astronomy has weighed and measured the sun long ago, and in our days chemistry, aided by physics, makes an analysis of it. The way in which this surprising result is arrived at, is explained under SPECTRUM. The main fact on which the method rests is briefly this: that a substance, when comparatively cold, absorbs the very same rays which it gives out when heated. Hence it was inferred by Kirchhoff that if there was sodium or iron in a comparatively cold state in the solar atmosphere, above the source of light, these substances would produce black lines corresponding in spectral position with the bright lines which they give out when heated. On this principle the presence in the solar spectrum of hydrogen, magnesium, calcium, sodium, and metals of the iron group has been ascertained with something like certainty. There are less clear indications of other metals, such as zinc and lead; while metals of the tungsten, antimony, silver, and gold classes have been searched for in vain. Of the metalloids, such as oxygen, carbon, nitrogen, sulphur, and the like, none had been detected till, in 1877, prof. Henry Draper of America announced the discovery

of oxygen. The presence of these substances in the sun is hardly doubted, but their identification is difficult. A chief source of complication in research of this kind is the effect on the spectra of substances produced by differences of temperature and pressure. Excessive heat seems to dissociate the groups of atoms forming the molecules into simpler groups, and thus produces a different spectrum difficult to recognize. The labors of Lockyer, Huggins, Janssen, Draper, and others are directed toward overcoming these and other obstacles.

4. *Physical Constitution of the Sun.*—Since the first discovery by Galileo of those remarkable phenomena on the sun called *sun-spots*—dark patches with an area frequently exceeding several times the surface of the earth—an immense variety of theories as to the probable constitution of the solar body has been brought forward by nearly every observer. Solar photography promises valuable aid in this research by enabling us to keep a permanent record of passing phenomena, ready at any time for deliberate measurement and comparison.

One of the most important discoveries in connection with sun-spots, science owes to Dr. Alexander Wilson of Glasgow, who, in the year 1769, observed certain general and remarkable features of sun-spots, which enabled him to establish the significance of these phenomena for a solution of the question as to the sun's physical constitution. These features are as follows: When a spot was near the middle of the sun, it was found to consist of a dark *central* part, called the *nucleus* or *umbra*, and *around this* was a comparatively brighter envelope, called the *penumbra*, and at such a time both parts were distinctly visible. But as the spot approached one border, the penumbra on the side nearest the observer became gradually more and more foreshortened, while the penumbra on the other side grew broader and broader, and at length, as the spot was disappearing—that is, passing the edge of the limb—the near side of the penumbra, as well as the dark central part, entirely vanished, nothing remaining except the opposite penumbra. When a spot made its appearance on the other side of the border, Wilson noticed the same phenomena in an opposite order, and soon discovered that they were nearly universal. It followed from these observations at once that every spot presents the appearance of a funnel-shaped opening in the sun's body, which, by the rotation of the latter, successively presented the described appearances. These observations have been abundantly confirmed by the photographic records of Messrs. De la Rue, Stewart, and Loewy.

Schwabe showed, as the result of nearly 40 year's observations, that the number of groups of sun-spots is not the same from year to year, but has a maximum about every 10 or 11 years; and gen. Sabine recorded the wonderful fact that the various epochs of maximum spot frequency are also those of maximum disturbance of our earth's magnetism. Here, then, we have a very curious bond of union between the sun and the planets of our system.

It was next shown by Carrington that sun-spots have a proper motion of their own—those near the solar equator moving faster than those near the poles.

While spots are darker than the general surface of the sun, there are also frequently observed patches brighter than the general surface. These are called *facule*, and they generally accompany spots, most frequently in their wake; but they are only distinctly visible near the sun's limb, and lose their specific luminosity near the center of the sun's disk.

Another phenomenon connected with our luminary is not less remarkable than sun-spots. This is the red flames, or *protuberances*, which were first observed surrounding the sun's disk on the occasion of a total eclipse, but which by ingenious methods of observation can now be rendered visible even when the sun is not eclipsed. This colored envelope, less brilliant than the *photosphere*, or light-giving surface, and having a mean height of 5,000 or 6,000 miles, is known as the *chromosphere*, and seems to consist mainly of incandescent hydrogen, jets of which are seen at times to be projected to a height of 200,000 miles. The velocity of these movements has been calculated to exceed at times 120 mile a second. Above the chromosphere there is a far deeper layer of cooler, sub-incandescent gases, among which is an unknown substance, which chiefly composes the outer portion, and is apparently lighter than hydrogen. These gaseous envelopes, extending together to 300,000 or even 500,000 miles above the photosphere, are now believed to cause the appearance called the *corona*, or white halo, which is seen to surround the dark body of the moon during an eclipse of the sun.

If a spot be a hollow, as we have reason to suppose, it is only necessary to believe that there has been a descending current of this cold absorbing atmosphere to account for the want of luminosity. In like manner, on this hypothesis, a facula will be a portion of the luminous matter, which has been removed high up into the atmosphere, and which thus escapes the absorbing influence of the atmosphere. A spot may thus be supposed, to be produced by two currents—one ascending, and carrying the hot luminous matter up; the other descending, and carrying the cold atmosphere down. The photosphere is thus in a constant state of agitation like ebullition.

Spots and their accompanying facule are an indication of the activity of those "convection currents" by which heat is brought to the surface to replace what has been radiated off. Their temporary prevalence then is held to be a sign of more than ordinary solar activity or expenditure of energy. This is palpably manifested on our globe in the greater magnetic disturbance that takes place when sun-spots are numerous, as

before mentioned. The diurnal range of the magnet freely suspended in the Kew observatory, shows an unmistakable correspondence with the waxing and waning of the spotted area on the sun; and the frequency of auroræ is found to be in perfect correspondence with prevalence of spots. It is natural to seek to connect cycles of weather with the spot-period of the sun, but nothing has yet been conclusively established. A coincidence has seemingly been made out between the recurrence of famines in southern India through deficient rain and the period of minimum spots; but the coincidence does not hold for other localities. Attempts have even been made to bring commercial crises and other recurring events into the spot-cycle.

As to the cause of the periodicity of sun-spots, observations made at Kew seem to establish a connection between the behavior of spots and the proximity of prominent planets; and it may thus be found that the recurrence of certain planetary positions in some way determines the spot-period.

SUN AND FIRE WORSHIP. All investigation tends to show that nature-worship was the basis of all polytheistic religions, and that the chief deities of the several mythologies were originally personifications of the sun, or of particular influences of the sun. The original solar nature of Jupiter, Zeus, Odin, Baal, Amen Ra (see EGYPT), Indra, etc., can hardly be mistaken. See those heads; also SCANDINAVIAN MYTHOLOGY, PHENICIA; and for a full development of the subject, Max Müller's essay on *Comparative Mythology* (Oxford Essays; 1856). The actual sun, however, still continued an object of worship, more especially as in the abstract and more strictly personal gods, moral and intellectual attributes came to predominate over and obscure the physical (see HELIOS); and with the worship of the sun was more or less closely associated that of fire—his representative on earth. 'See PARSEES, NEEDFIRE, BELTEIN.

The most complete system of sun-worship that we have any account of is that existing in Peru when discovered by the Spaniards (1526). "Our northern natures can hardly comprehend how the sun, and the moon, and the stars were imaged in the heart of a Peruvian, and dwell there; how the changes in these luminaries were combined with all his feelings and his fortunes; how the dawn was hope to him; how the fierce mid-day brightness was power to him; how the declining sun was death to him; and how the new morning was a resurrection to him; nay, more, how the sun, and the moon, and the stars were his personal friends, as well as his deities; how he held communion with them, and thought that they regarded every act and word; how, in his solitude, he fondly imagined that they sympathized with him, and how, with outstretched arms he appealed to them against their own unkindness, or against the injustice of his fellow-men."—Helfs's *Spanish Conquest of America*. The Incas, as the Peruvian monarchs were called, claimed to be children of the sun, and his representatives on earth. Their government was a despotic theocracy, of which the Inca was both high-priest and king. In Cuzco, the capital, stood a splendid temple to the sun, all the implements of which were of gold. On the w. end of the interior was a representation of the sun's disk and rays in solid gold, so placed that the rising sun, shining in at the open e. end, fell full upon the image, and was reflected with dazzling splendor. In the place or square of the temple, a great annual festival was held at the summer solstice. The multitude, assembled from all parts of the empire, and presided over by the Inca, awaited in breathless solemnity the first rays of their deity to strike the golden image in the temple, when the whole prostrated themselves in adoration. Sacrifices, similar to those of the Jews, were offered on the occasion, and bread and wine were partaken of in a manner strikingly resembling the Christian communion.

"It must not be supposed that the sun alone absorbed the devotion of the Peruvians. There was little in nature that they did not contrive to make a deity of. The moon, as the spouse of the sun, the planet Venus as his page, the Pleiades, and the remarkable constellation of the southern cross, were minor deities. The rainbow and lightning were also worshiped as servants of the sun; and fire, air, earth, and water were not without adoration."

SUNAHSEPHEA is, in the ancient legends of India, the son of a poor Brahman, Ajigarta, who was sold by his father for 100 cows to *Haris'chandra* (q.v.), and offered by the latter as a victim to Varun'a, instead of his own son Rohita, whom he had pledged himself to sacrifice to this god. The legend relates that when Sunahsephe was bound to the sacrificial post by his own father—for no priest could be found to perform the ceremony—and when his father came whetting his sword to kill him—for neither was any priest to be found who would perform such a sacrifice—Sunahsephe prayed in succession to the gods Prajâpati, Agni, Savitrî, Varuna, again to Agni, then to the Vis'we-Devâh', Indra, the As'win, and the dawn; and while he praised the dawn with three verses, at the delivery of each verse his fetters became looser, and when the last verse was said, he became free again. He left afterward the family of his parents, and was adopted by *Vis'vâ-mitra*, under the name of Sunah's'ephe Devarâta (the God-given). The *Atitareya Brâhmana* (see VEDA), where this legend is related, also ascribes to him the first performance of some Vedic ceremony.

SUNART, Loch, an inlet of the sea in the extreme w. of Argyleshire, Scotland, having the districts of Ardnamurchan and Sunart on the n., and that of Morven on the

s.; length, inland from the Sound of Mull, 19 m.; breadth varies from 3 m. to 3 furlongs. At its head stands the village of Strontian.

SUNBIRDS, *Cinnyridæ*, a family of birds of the order *insessores* and tribe *tenuirostres*, which may be regarded as a connecting link between the creepers and the humming-birds, and as occupying nearly the same place in the tropical parts of the Old World which belongs to the humming-birds in America. They are all of small size, although none are so small as the smallest humming-birds; they rival humming-birds in brilliancy of plumage, and like them they feed on the juices of flowers, which they suck by their long bill; they do not, however, flutter on the wing when feeding, like humming-birds, but perch on or beside the flower into which the bill is to be inserted. The species are very numerous, and are natives of the southern parts of Asia, the eastern Archipelago, and Africa. The resplendent metallic plumage belongs only to the male, and only to the breeding season.

SUNBURY, a co. in s.e. New Brunswick, crossed by the European and North American railroad and the Fredericton branch; drained by St. John's river; 1200 sq.m.; pop. '71, 6,824. The surface is mostly level and densely timbered; the soil is fertile. Co. seat, Oromocto.

SUNBURY, a borough of Upper Augusta township, Northumberland co., Penn., near the junction of the branches of the Susquehanna, about 55 m. from Harrisburg, on the Northern Central railroad; pop. '70, 3,131. The place has some importance as a railroad junction and coal-shipping station. There are 2 machine-shops, 2 foundries, a daily and 3 weekly papers, and a bank.

SUNDA ISLANDS, that great chain of islands belonging to Malaysia, running e., commencing with Sumatra (q.v.), and ending with Timor (q.v.), and separating the Java sea from the Indian ocean. Sunda strait is a passage, from 70 to 90 m. in breadth, between Sumatra and Java.

SUNDAY. See **SABBATH**; **LORD'S DAY**; **PUBLIC-HOUSES**.

SUNDAY-SCHOOLS were founded about the close of the year 1781 by Robert Raikes, a printer in Gloucester. Business leading him into the suburbs of the town, inhabited by the lowest class of the people, he was struck with concern at seeing a group of children, miserably ragged, at play. He was informed that "on Sunday the street was filled with a multitude of wretches, who, having no employment on that day, spent their time in noise and riot, playing at chuck, and cursing and swearing." To check this deplorable profanation of the Lord's day he engaged four women, who kept dame schools, to instruct as many children as he should send them on the Sunday, in reading and the church catechism, for which they were to receive one shilling each. In a short period a visible improvement was effected both in the manners and morals of the children, who came in considerable numbers; they attended church with their mistresses, and a great many learned to read and say their catechism. Such was the origin of the Sunday-schools. This excellent scheme was noticed in the Gloucester newspaper in 1783; but a letter of Mr. Raikes, from which the above account is taken, published in the *Gentleman's Magazine* in 1784, first drew general attention to it. Numerous schools, formed on the same model, sprang up in all the principal towns; and a society, under high patronage, was formed in London in 1785 for the establishment and support of Sunday-schools throughout the kingdom, which in 14 years expended £4,000 in payment of teachers. Her majesty, queen Charlotte, admitted Mr. Raikes to an audience, and expressed her high approbation of his plan. This was the first stage of the Sunday-school. The great impediment to its prosperity was the expense of hiring so many teachers. Even in Gloucester, the birthplace of the Sunday-schools, after Mr. Raikes's death in 1811, all the Sunday-schools were closed for a time owing to want of funds. Whoever first conceived the idea of gratuitous instruction has nearly as great merit as Mr. Raikes himself; but probably it was suggested by necessity to many minds in different places at the same time. It was the means of starting Sunday-schools on a new career of success, and the idea spread so rapidly that, by the year 1800, the teaching was almost universally gratuitous. A higher class of teachers offered their services; the schools ceased to be filled by the very poorest alone; handsome buildings were erected in connection with the different churches and chapels, or by general subscription, and that system was organized which has covered the land with schools. The secular teaching, which in certain instances included writing and arithmetic, was not of a very high order; but it placed the key of knowledge in the hands of multitudes who would otherwise have been unable to read; and the religious instruction with which it was combined has molded the character of some of the best men in England. In 1803 the Sunday school union was formed, which, by its numerous publications, its traveling agents, and its connection with branch societies in every part of the kingdom, has exercised great influence on the Sunday-school cause. The institute of the church of England, which operates in a similar manner, is of later date. Within the last 20 years the Sunday-school has entered upon a third stage of its history. The improvement and multiplication of week-day schools obviate the necessity for teaching reading in Sunday-schools, so that they have gradually become restricted to religious instruction. This for a time threatened to affect their popularity, but as the teachers were earnest men they culti-

vated the art of teaching with considerable success. Sunday-schools have prospered in Scotland, where religious teaching alone ever prevailed, and the stability of this modern invention is accomplished.

The Sunday-school found its way into Scotland as early as the year 1782; but it was not till 1786, when the society for promoting religious knowledge among the poor was formed, that it was publicly recognized; nor till 1797, when the gratis Sunday-school society was originated, that schools became general. At first they met with considerable opposition from portions of the ecclesiastical courts, but they are now supported by all the churches. Sunday-school unions exist in Edinburgh, Glasgow, and most of the large towns. The names of Dr. Chalmers, James Gall, the author of the *Lesson System*, and David Stowe, the author of the *Training System*, deserve mention in connection with the progress of Sunday-schools in Scotland. In Ireland Sunday-schools had been partially anticipated in county Down in 1770; but it was not till 1785 that the system pursued by Mr. Raikes was adopted, since which its history has been analogous to that of England. The Sunday-school society for Ireland was established in 1809. Sunday-schools were introduced into New York in 1816, through the exertions of some benevolent ladies, from which they have spread themselves through the United States. They are now to be found wherever the English tongue is spoken. They thrive vigorously in the Protestant churches of France; and more recently have been planted in parts of Germany and Italy. The Roman Catholics, in this country at least, have numerous Sunday-schools. It is stated on good authority that there are in the United Kingdom about 300,000 teachers and 3,000,000 scholars; and in the United States there are 750,000 teachers and nearly 6,000,000 scholars. Of the teachers and scholars elsewhere it is not easy to form any estimate.

SUNDAY-SCHOOLS (*ante*). The first permanent Sunday-school organization in the United States, of which there is authentic record, was The First-day or Sunday-school society, formed in Philadelphia, 1791. It was composed of members of different denominations including the society of Friends. Its constitution required that the instruction given in its schools should be "confined to reading and writing from the Bible, and such other moral and religious books as the society may direct." The New York Sunday-school union was instituted, 1816; the Philadelphia Sunday and adult school union, 1817. These three societies recognized the union of different denominations, and led to the organization of the American Sunday-school union at Philadelphia, 1824. The suggestion that such an association should be formed came from New York. Its object was to concentrate the efforts of Sunday-school societies in different sections of the United States, and to endeavor to plant such schools wherever there is a population. As the new states were settled and the various religious denominations were strengthened, more attention was given by each to its own Sunday-schools, and denominational unions to promote them were formed. In the early history of the schools the chief thing expected of the children was to commit to memory portions of scripture, and the chief employment of the teachers was to hear the recitations. Afterward the question book was added to the recitation, and at length in a great degree superseded it. Still later came the lesson helps, golden text, blackboard exercises, etc. In the first schools, reward tickets were given, and when they had sufficiently accumulated were exchanged for books. This stimulated the production of volumes of suitable character, and from this the Sunday-school library has been developed. At the Robert Raikes centenary held in London, 1850, the following statistics for the United States were reported: Number of Sunday-schools in all the states and territories 82,216, containing 886,328 teachers and 6,623,124 scholars.

SUNDERBUNDS, a tract of British India, presidency of Bengal, consists of a number of low islands, forming the delta of the Ganges. The tract extends e. from the mouth of the Hoogly to the island Rabanabad, is 158 m. long, 75 m. broad, has an area of 5,341 sq. m., and an inconsiderable population. The islands are separated from each other by narrow channels, through which the waters of the Ganges force their way to the sea. The chief channels (14 in number) are navigable for the largest craft used in inland navigation. In such of the islands as have not been cleared, luxuriant woods abound, and afford lairs for the tiger, wild boar, and other ferocious animals. Government has commenced vigorous operations for the clearing of the islands, and grants of land are offered to settlers at a nominal rate. The climate, though improving, and capable of further improvement, is, as might be expected, very unhealthy. Rice, sugar, and indigo are produced in the cleared districts. Large quantities of fish, obtained in the waters of the Sunderbunds, are sent to Calcutta. Large and fierce alligators abound in the channels.

SUNDERLAND, a thriving municipal and parliamentary borough and sea-port, in the county of Durham, 13 m. n.e. of the city of that name, at the mouth of the Wear. The town may be said to be co-extensive with the parliamentary borough, and to include the suburbs of Bishop-Wearmouth on the s. bank, and Monk-Wearmouth and Southwick on the n. bank of the river, connected with Sunderland proper by an iron bridge of one arch, 236 ft. long, and nearly 100 ft. above the river at low water. The bridge over the Wear was erected in 1796, but was repaired and widened in 1858 by Robert Stephenson (q.v.), at the cost of about £40,000. On both sides of the river there are extensive wet

docks, much of the area of which has been reclaimed from the sea. The harbor, which is defended by batteries, is formed by two great piers, one 650 yards and the other 590 yards in length; and the port is resorted to by vessels of the largest tonnage, from all commercial countries. In 1875, 3,169 vessels, of 820,137 tons, entered, and 8,908, of 2,177,128 tons cleared the port; in 1877, goods (chiefly coals) worth £706,611 were exported. After Newcastle, Sunderland is the greatest coal-shipping port in the world. The sanitary condition of the town has been recently greatly improved; a large new infirmary was built in 1867, and in 1868 a spacious workmen's hall. Ship-building is one of the principal branches of industry. Glass, earthenware, ropes and chains, anchors, and other iron-wares, are very extensively manufactured. The public park of Sunderland, about 70 acres in extent, is adorned with a bronze statue of gen. sir Henry Havelock, a native of the town, and commands a fine view of the sea. The village of Roker, a mile from the town, is much resorted to for sea-bathing. Fishing is carried on to a considerable extent. Pop. of parliamentary borough, which returns two members to the house of commons (1871) 104,409; of municipal borough, 98,242.

SUNDERLAND, ROBERT SPENCER, second Earl, was the only son of HENRY, first earl, who had been raised to the peerage in 1643, for his exertions in the royal cause. He was born in 1642, and after serving as ambassador to several courts, became in 1679 secretary of state. He had by this time manifested remarkable talent. Bishop Burnet says of him, "He had a superior genius to all the men of business that I have yet known." At first, he united with Essex and Halifax in opposing Shaftesbury, who wished to set Monmouth on the throne, and favored the exclusion of the duke of York. He encouraged the king to persevere in the degrading French alliance, and, with the duchess of Portsmouth, to whom he attached himself, negotiated a treaty by which, in consideration of an annual pension from the French king, Charles was to agree to assemble no parliament for three years. Before the end of the year, he had shaken off Essex and Halifax; and a new triumvirate, consisting of himself, lord Hyde, and Godolphin, succeeded to the confidence of Charles II. The treaty with France was broken off, and Sunderland, who was now afraid of the whigs, engaged the king in a more popular alliance with Spain. After the dissolution of the last of the exclusion parliaments, he lost his office; but the duchess remained faithful to him in disgrace; and by her influence, and that of lord Rochester, he was, in 1682, says Bishop Burnet, "upon great submission made to the duke [of York], again restored to the secretary." He remained in office until the accession of James II., when his influence in the ministry became greater than ever. He who had so often saved himself in the former reign by the influence of the duchess of Portsmouth, now secured himself another patroness in the king's second wife, the princess of Modena. Although there is reason to believe he gave some encouragement to Monmouth in his rebellion, he managed, with consummate art, to obtain the entire confidence of James, and in 1685 became prime-minister. He was intrusted with a knowledge of the king's intention to establish the Roman Catholic religion as the national church, and was indeed the only minister in whom the king confided. In 1687 he privately conformed to the Roman Catholic church, and afterward openly professed his conversion. His influence was so great, that James would grant no favor until he had asked the question, "Have they spoken to Sunderland?" and when told that this nobleman got all the money of the court, he would reply, "He deserves it." Yet we find him about this time in correspondence with the prince of Orange, afterward William III. The princess Anne described Sunderland as "the subtillest workingest villain that is on the face of the earth." Burnet says he entered into a particular confidence with the prince of Orange, which he managed by his uncle, Mr. Sidney, who was sent envoy to Holland. With profligate but masterly dexterity, he contrived to deceive both his master and Barillon, and to keep them in ignorance of the events that were passing in Holland. When the prince arrived in England, Sunderland and his wife went to Amsterdam, whence he wrote to the new monarch, claiming his favor and protection on the ground that he had all along been in his interest. In 1691 he was allowed to return to England, and to kiss the king's hand. In 1695 William III. spent a week at Sunderland's house at Althorpe. It was imputed to him that he had changed his religion, in the late reign, in order the more effectually to ruin king James; and it was generally believed that he had rendered king William, when prince of Orange, some signal services, which no one else could have done. This belief gained credit from the favor shown him by William. He was made lord chamberlain, and as such took his seat at the head of the council table. After directing affairs as the acknowledged head of the government, he resigned office in 1697, and retired to private life. He spent the rest of his days at Althorpe, where he died in 1702. He never shone as a public speaker. He had, however, unusual abilities for business, and a rare skill in the art of insinuation. He possessed exquisite courtly talent, extraordinary versatility, and a flexibility of principle too common in his day, but carried by him to the most reprehensible lengths. By his wife, Anne, daughter of the second earl of Bristol, he left CHARLES SPENCER, third earl, who was born in 1674. He was described by Evelyn as a youth of extraordinary hopes, very learned for his age, and ingenious. He was for some time secretary of state in the reign of queen Anne, and under George I. rose to be all-powerful; but in 1721, being accused of receiving £50,000 worth of the fictitious stock distributed by the direc-

tors of the South Sea scheme (q.v.), in order to bribe the government, he was acquitted only by an inconsiderable majority and that from party considerations, and the indignation of the public made him resign his office. He died in 1722, not without suspicion of having intrigued, after his fall, for the restoration of the Tories, if not for the return of the pretender. Sunderland was a type of the political morality, or rather immorality, of a disgraceful age, when the greatest statesmen made no scruple of sacrificing either their own party, or the interests and dignity of the nation, to personal ambition. His title descended to CHARLES, his second son, who succeeding, 1733, to the honors of his illustrious grandfather, John Churchill, the earldom of Sunderland became absorbed in the dukedom of Marlborough. His third son, JOHN, was ancestor of the earls Spencer.

SUN-DEW, *Drosera*, a beautiful and interesting genus of plants of the natural order *droseracea*, three species of which are natives of Britain, found in bogs and moist heathy ground. The most common is the ROUND-LEAVED SUN-DEW (*D. rotundifolia*), which is plentiful in almost all places suitable to the plant. The leaves all spring from the root, and spread out in a rosette, from the center of which springs the flower-stem or scape, with a raceme of flowers all on one side. The leaves of this and the other species are fringed and beset in all parts with hairs, which bear at their extremity viscid glands, and the irritation of these glands causes them to contract and fold up, so that insects are imprisoned by them. Recent observation has proved that these insects are actually digested by the plant, their nutritive material being absorbed by it. Compare the *dionea* (q.v.), and see Darwin's *Insectivorous Plants* (1875). The whole plant is acrid, curdles milk, and has a reputation for removing corns, bunions, and warts. An agreeable liqueur, called *rossoli* (*ros solis*) is made by infusing the plant in brandy, with sugar, etc.

SUN-DIAL. See **DIAL**.

SUNFISH, *Orthogoriscus*, a genus of fishes of the family *diodontidae* (see **DIODON**), having the body compressed, and not capable of inflation, as in the other *diodontidae*; abruptly terminating in a very short tail; the dorsal and anal fins long and pointed, united to the short tail-fin; each jaw furnished with a cutting edge of bone instead of teeth. The species chiefly inhabit the seas of warm climates, but two are occasionally seen on the coasts of Britain. The SHORT SUNFISH (*O. mola*), when young, is almost perfectly round, but becomes rather more elongated when full grown. The name sunfish is variously regarded as derived from the form of the fish, and from its habit of floating at the surface of the water in fine weather, as if to enjoy the sunshine. It attains a large size, being sometimes more than six ft. in length, and is captured by sailors. Its flesh is white and well flavored, somewhat resembling that of the skate. The liver yields a large quantity of oil, which is in repute among sailors as an external application for the cure of sprains, rheumatism, etc. The OBLONG SUNFISH (*O. oblongus*), of which specimens have also been taken on the British coasts, but more rarely, is of a longer form. It also attains a large size. The sunfishes feed upon sea-weeds.

SUNFLOWER, *Helianthus*, a genus of plants of the natural order *compositae*, suborder *corymbifera*, having large flowers; the florets of the ray strap-shaped, without stamens or pistils, yellow or orange; the florets of the disk tubular, perfect, yellow or purplish-brown; the flowers solitary or in corymbs, with an involucre of numerous leaves; the fruit compressed, with a pappus of two or more deciduous scales. The species are numerous, all natives of America; large herbaceous plants, with opposite or sometimes alternate undivided leaves. The ANNUAL SUNFLOWER (*H. annuus*), common in our flower-gardens, is a native of tropical America, where it sometimes attains a height of 20 feet. The stem is thick and rough; the flowers solitary, and from one foot to two feet in diameter, nodding; the leaves heart-shaped-ovate. This plant is now cultivated in almost all parts of the world, and in the s. of Europe is sometimes a field-crop; the seeds being valued as food for cattle and poultry, and on account of the oil which they yield, which is little inferior to olive oil. An acre of good land produces about fifty bushels of seed, each bushel yielding a gallon of oil. The seeds are also used like almonds for making demulcent and soothing emulsions; and in some parts of Europe, a bouilli is made of them, which is used as food for infants. The American Indians make bread of them. The flowers abound in honey, and are much frequented by bees. The leaves are good fodder for cattle. The stems are used for fuel, and yield much potash.—The Jerusalem artichoke (q.v.) belongs to this genus.

SUNFLOWER, a co. in n.w. Mississippi, traversed centrally by the Sunflower river; 720 sq.m.; pop. '80, 4,661—4,587 of American birth, 2,895 colored. The surface is low, swampy in some sections; a large proportion woodland. The soil is fertile, producing cotton, grain, sweet potatoes, and live stock. Co. seat, Johnsonville.

SUNN, *Crotalaria* (q.v.) *junecea*, a leguminous plant, native of India, which has been in general cultivation there from time immemorial, for the fiber of its bark. It has a strong general resemblance to Spanish broom. It is, however, an annual plant. The plant is cultivated not only for its fiber, but as food for milch-cows. The seed is generally sown in April or May, and in August it is pulled, or cut close to the ground—when grown for its fiber—laid in long rows till the leaves begin to rot and separate from the stalks, and steeped in water for a few days, till the bark separates freely. The

fiber is not so strong as hemp; but good cables, canvas, and cloth are made of it. It is now imported in considerable quantity into Britain. It is known by various names. *Tuag* is one of its Indian names, and it is sometimes called *brown hemp*, *Bengal hemp*, etc. The confusion of names makes it difficult to ascertain the quantity imported.

SUNNA (Arab. custom, legal usage), originally denotes among Moslems the sayings and the example of Mohammed and his community, provided they are in accordance with the Koran, the meaning of which, however, is itself explained by the Sunna. The term is therefore (though incorrectly) used for the collections of moral and legal traditions traced to the prophet, which supplement the Koran, somewhat like the Mishna (q.v.), which supplements the laws of the Pentateuch. The Sunna not only comprises religious doctrines and practice, but also civil and criminal laws, and the usages of common life: the way to eat and to drink, and to dress, and the like. This tradition is first heard of during the civil wars among the adherents of the new faith, about half a c. after the flight. The single traditions, as we now possess them, rarely exceed six lines. The diction is carefully wrought, and the form is that of a dialogue. For the credibility and canonicity of a tradition, it was originally necessary that it should have been *heard* by one truthful witness; but this law was much relaxed in after-time. At the end of the 3d c. (H.), a countless number of individual collections (Mosnad), mostly of an apocryphal character, had been produced by different theologians, but the first who sifted them critically, and without regard to any special theological system, was Bochary (d. 256 H.). His collection contains 7,275 single traditions, 4,000 of which, however, occur twice in the work. Moslim, his pupil, supplemented Bochary with another collection, containing 12,000, again including 4,000 repetitions. Besides these, there are four more "canonical" collections; by Abû Dawûd (d. 275 H.), Tirmidzy (d. 279), Nasây (d. 303), and Mâga (d. 273). The Sunna, as we have it in these collections, contains, broadly speaking, more truth than it is generally supposed to contain, and, critically used, is, besides the Koran, the most authentic source of Islam. A selection from the different collections (both canonical and otherwise), called *Mishcat Al Masabih*, has been translated into English by capt. Matthews (Calcutta, 1809). Fragments from Bochary are found in a German translation, by Hammer, in the *Fundgruben des Orients*.

SUNNITES, traditionists or believers in the Sunna (q.v.); the name of the "orthodox" Moslems as opposed to the Shiites (q.v.). They are subdivided into four principal sects, who, though at issue on different minor points, yet are acknowledged by each other to belong to the faithful, and to be capable of salvation, and they each have a special oratory at Mecca. The first of these sects are the Hanefites, founded by Abu Hanifa, who died 150 years after the Hegira. They are emphatically called "the followers of reason," whilst the other three are guided exclusively by tradition. They allow reason to have a principal share in their decisions on legal and other points. To this sect belong chiefly the Turks and Tartars. The second sect are the Malekites, founded by Malek Ibn Âns, who died about 180 H. at Medina. As one of the chief proofs of his real piety and humility, it is recorded that when asked for his decision on 48 questions, he would only decide on 16, freely confessing his ignorance about the others. In Barbary and other parts of Africa, the greatest part of his adherents are found. Mohammed Al Shâfeî, born in Palestine, 150 H., but educated in Mecca, is the founder of the third sect, the Shâfeîtes. He was a great enemy of the scholastic divines, and seems altogether to have been of an original cast of mind. He never swore by God, and always took time to consider whether he should at all answer any given question or hold his peace. The most characteristic saying recorded of him is, "Whosoever pretends to love both the work and the Creator at the same time, is a liar." He is accounted of such importance, that, according to his contemporaries, "he was as the sun to the world, and as health to the body;" and all the relations of the traditions of Mohammed were said to have been asleep until he came and woke them. He appears to have been the first who reduced Moslem jurisprudence into a method, and thus made it, from a number of vague sayings, a science. His followers are now chiefly found in Arabia and Persia. Ahmed Ibn Hanbal founded the fourth sect, the Hanbalites. He was born 164 H., and was a most intimate friend of Shâfeî. His knowledge of the traditions (of which he could repeat no less than a million) was no less famed than was his piety. He taught that the Koran was not created, but everlastingly subsisted in the essence of God; a doctrine for which he was severely punished by the caliph Almotasem. On the day of his death, no less than 20,000 unbelievers (Jews, Christians, and Magians) are said to have embraced the Mohammedan faith. Once very numerous, the Hanbalites now are but very rarely met with out of Arabia. On the differences between the Sunnites and Shiites, see SHIITES.

SUN-STROKE (otherwise called *heat apoplexy*, *heat asphyxia*, *coup de soleil*, *erythis mus tropicus*, and *insolatio*, the name by which it is officially known in the returns of the registrar-general) is a very fatal affection of the nervous system, which seldom occurs in Great Britain, except in extremely hot summers, but is very common in India and other tropical countries. Our knowledge of the nature of this remarkable disease is almost entirely based upon the accounts which have been given of it by Indian medical officers. It is from their reports that the most satisfactory history of this disease at present published—that, namely, of Dr. Aitken in his *Science and Practice of*

Medicine, 3d ed. 1834—is mainly drawn up. From the accounts given by these observers, it is clear that the symptoms of the disease are liable to be greatly modified in different cases. Mr. Russell, when in charge of the 68th regiment in May, 1834, shortly after its arrival at Madras, with the men in robust health, has given the following account of this disease: "The funeral of a general officer being about to take place, the men were marched out at an early hour in the afternoon, buttoned up in red coats and military stocks, at a season, too, when the hot land winds had just set in, rendering the atmosphere dry and suffocating even under the shelter of a roof, and when the sun's rays were excessively powerful. After having proceeded two or three miles, several men fell down senseless. As many as eight or nine were brought into hospital that evening, and many more on the following day. Three men died—one on the spot, and two within a few hours. The symptoms observed (and they were alike in the three cases), were, first, excessive thirst, and a sense of faintness; then difficulty of breathing, stertor, coma, lividity of the face, and in one whom Mr. Russell examined, contraction of the pupil. The remainder of the cases (in which the attack was slighter, and the power of reaction perhaps greater) rallied; and the attack in them ran on into either an ephemeral or a more continued form of fever." Aitken, *op. cit.* One of the earliest symptoms, noticed by several observers, is the skin becoming rough and acule, and the perspiration ceasing; the heat of the surface becomes at the same time much increased; the bowels become obstinately constipated. The actual attack, in the various cases described by the Indian surgeons and physicians, came on generally when the men were in their tents, sometimes during the day, but in several cases during the night. The patient had been generally lying down, often seemingly asleep, when the attention of his comrades would be directed to his hurried and heavy breathing, and on attempting to rouse him, he was found to be insensible. The mortality from sun-stroke is about 50 per cent. In the cases that terminate favorably a gradual remission of the symptoms takes place; and when the skin becomes cool and moist, and sleep has been procured (phenomena which usually occur within 36 hours of the attack), the patient may be regarded as out of danger.

The predisposing causes of sun-stroke are (1), an unusually elevated degree of temperature, accompanied by great dryness of the air; (2) The electrical condition of the atmosphere that precedes a thunderstorm; (3) A contaminated atmosphere from overcrowding; (4) All debilitating causes, such as prolonged marches, previous disease, intemperate habits, etc. Death sometimes occurs so suddenly that there is little opportunity for treatment, but the general indications in these cases are—the cold douche, from a height of three or four feet, keeping the surface wet and exposed to a current of air, the exclusion of light as far as possible, and the free employment of stimulants. In less rapidly fatal cases the outer clothing should be removed, and the douche applied, as before, over the head and along the spine. Relaxation of the pupil is the first favorable sign. If the pulse flags the douche must be replaced by the mere application of cold to the head. The hair must be cut as short as possible, and the nape of the neck blistered as speedily as possible. If insensibility recurs after an interval of ten or twelve hours, a blister should be applied to the crown of the head. The extremities and chest should be stimulated with mustard poultices. Immediately after the employment of the douche, a strong purgative injection should be thrown up the lower bowel by means of a long stomach-pump tube (as, for example, a mixture of an ounce and a half each of castor oil and oil of turpentine, and two drams of tincture of asafetida in about half a pint of barley-water). Under no circumstances should there be any abstraction of blood. The preventive measures are of more importance than the treatment; but this is a subject into which we have not space to enter. The advice of the regimental surgeon is too often disregarded by the commanding officer; and the lines which are italicized in Mr. Russell's account of the cases—quoted at the beginning of this article—would seem to contain a well devised prescription for the induction rather than the prevention of sun-stroke.

SUONADA (inland sea), an inland sea of Japan, which separates the island of Kiusiu and Sikop from the larger one of Nipon. It is about 250 m. in length from the strait of Simonoseki to Osaka; and sir R. Alcock estimates its greatest breadth at 50 miles. It is studded with innumerable islets and a few rocks. The scenery is picturesque. The prince of Nagato and Soulio having, contrary to treaty stipulations, closed this sea to foreign vessels and fired upon them, the English, French, and Dutch fleet destroyed the forts that barred its entrance (Sept. 5 and 6, 1864), with the loss to the allied squadron of 12 men killed and 60 wounded.

SUPERANNUATION is a retiring allowance granted under an act of 1859, 22 Vict. cap. 26, to all persons not being weekly laborers employed permanently in the civil service of the country. Before the age of 60, retirement can only take place from broken health (or ostensibly so), or from abolition of office: after 60 any person may retire. If the retirement take place before completing ten years' service, a gratuity only is allowed. After ten years, the pension is $\frac{1}{10}$ of the salary at the time of retirement for every year of service, up to $\frac{4}{10}$, which is the maximum allowed, except under very special circumstances, when the treasury may grant larger pensions, never, however, exceeding the salary vacated. Professional persons appointed later in life than the usual age may

have pensions computed with a number of years, not exceeding 20, added to their actual service. On the other hand, the treasury may, for grave demerit, diminish a pension below the scale granted in the act. A person on a pension is liable to recall to a position as good as he vacated up to the age of 60, if in suitable health. A civil servant is defined to be one holding appointment direct from the crown, or under certificate from the civil service commissioners; and his salary must be paid out of the consolidated fund or out of moneys voted by parliament. Weekly laborers are ineligible; but artificers may serve for superannuation, provided they are not paid at the full current market rates of wages. See RETIREMENT.

Superannuation is one of the great boons of the permanent civil service, in which the officials are, as a rule, paid salaries lower than they could earn elsewhere; but to render promotion tolerably certain, retirement at 60 should be, not as now voluntary, but compulsory. At present an official may at his option serve as long as he is capable of attending office; and many actually do die in harness, years after they have become useless.

SUPERCARGO is an important officer in a merchant vessel, charged with the control of all her commercial transactions. The cargo is under his care, and he judges as to its disposal and replacement.

SUPEREROGATION, WORKS OF (Lat. *supererogata*, over and above things required), a class of works which, in the Roman Catholic system, are described as not absolutely required of each individual as conditions to his eternal salvation. Roman Catholics found this definition on the distinction between what they believe to be commanded and what they hold to be only counseled, for an example of which they appeal to the words of our Lord to the young man in Matthew xix. 21, which distinguish one class of works which are necessary in order to "enter into life," and a further class which must only be done if we "would be perfect." Roman Catholics do not profess to recognize in works of supererogation any distinctive essential quality by which they differ, whether in their physical or their moral entity, from other works, and in virtue of which, by their own nature, the individual may found upon them a personal claim to reward. For works of supererogation, as for all supernaturally good works, they hold that the assistance of God's grace is indispensably necessary; and they do not ascribe to them any merit, except that which arises from God's own free and gratuitous promise. In one word, the only distinctive characteristic of a work of supererogation lies in its not being supposed to be prescribed or commanded as absolutely necessary for the salvation of the individual, and its being done for the sake of greater perfection; and the doctrine which teaches the possibility of such works is, according to Catholics, a necessary consequence of the unequal fervor and unequal degrees of holiness which exist even in the class of the virtuous servants of God. A further consequence of this doctrine is that God may accept the superabundant works of one in atonement for the defective service of another; and hence, in the Catholic theory of indulgences (q. v.), along with what they regard as the infinite and inexhaustible treasure of the merits of our Lord, they also regard, although in a degree infinitely inferior, the superabundant merits of the saints as forming part of that "treasure of the church" which is applied in the form of indulgences.

SUPERFETATION, or the circumstance of two distinct conceptions occurring in the same woman at an interval of greater or less duration, so that two fetuses of different ages—the offspring possibly of different parents—may co-exist in the uterus, is a subject of great interest both in a scientific and in a medico-legal point of view. A couple of centuries ago, there was a universal belief in not only the possibility but the comparative frequency of this occurrence. Fifty years ago, it was as universally disbelieved; and now again (owing to the investigations of various inquirers, among whom Dr. Bonnar of Cupar deserves special mention), we are returning to the belief of our ancestors. The cases described as instances of superfetation may be arranged in three classes; but as will be presently seen, it is only to the cases of the third class that the term superfetation is truly applicable. The *first class* includes the numerous undisputed cases in which two mature children, bearing evidence, from their different colors, that they are the offspring of different parents, are born at the same time. In the slave states of America, it was by no means uncommon for a black woman to bear at the same time a black and a mulatto child—the former being the offspring of her black husband, and the latter of her white lover; and the converse has occasionally occurred—a white woman at the same time bearing a white and a mulatto child. There is no difficulty in accounting for these cases, which are examples of contemporaneous conception rather than true superfetation. The *second class* includes those cases in which a twin has been aborted, leaving its fellow undisturbed in the uterus, to be matured and born in due time, or in which twins have been produced at the same time, one of which was fully formed, while the other was small and apparently premature, from being "blighted" or arrested in its development at an early period. Cases of these kinds are by no means rare; but there is no reason for believing that the infants were conceived at different periods. The *third class* includes the cases in which a *mature* child has been born, and an *immature* fetus, the product of a different conception, has either been left in the womb until its period of maturation, or, if expelled along with the other, has presented no mark of wasting or of arrested development. "In a case of genuine superfetation,"

says Dr. Bonnar, "a woman must bear two (or more) *mature* children, with an interval of weeks or months between the birth of each; or, if she part with the whole contents of the uterus at the first delivery, the difference of the ages of the fetuses, or the mature child and the fetus, as the case may be, must be unmistakable, and there must be the absence of all marks of blight of the latter, so as to leave no doubt that, had it remained in utero, it would have gone on to perfect maturity." Among the cases of superfetation that have been specially discussed by writers on midwifery and medical jurisprudence, are the following: (1) Velpeau quotes from the *Recueil de la Société de Médecine* the case of a woman named "Arles," who, in 1796, gave birth to a child at the full time, and five months afterward to another, which was also thought to be at the full time; (2) Dr. Maton, an eminent London physician, communicated to the college of physicians the case of Mrs. T—, an Italian lady, who was delivered of an apparently healthy and mature male child on Nov. 12, 1807, but which lived only nine days. On Feb. 2, 1808, or 82 days after the birth of the first, she was delivered of a second child, which likewise had every sign of being completely formed and mature. The following case, which, as Dr. Bonnar (in his *Critical Inquiry regarding Superfetation*, Edin. 1865) observes, "has been the principal battle-field of the advocates of superfetation and their opponents," and has given rise to more discussion than any other, is recorded by Dr. Desgrange of Lyon. Madame Villard had a miscarriage at seven months on May 20, 1779. In about a month thereafter she conceived again, and on Jan. 20, 1780, she brought forth a living child. No milk appeared in her breasts, the abdomen did not seem to diminish in size, and other symptoms which normally follow delivery were absent. The two surgeons who were in attendance being naturally puzzled, called in Dr. Desgrange, who declared, in opposition to their views, that there was still a child in the womb; and his opinion was confirmed by her being delivered of a living child on July 6, 1780, 167 days after the first birth. Dr. Bonnar has collected from *The Puerage* a number of cases of probable superfetation occurring in married life. Excluding a very few exceptional cases, he adopts Dr. William Hunter's view, that 210 days, or seven calendar months, is the minimum period of uterine life at which a child should be born in order to be reared, and he assumes that no prolific intercourse can take place until at least fourteen days after the first delivery; and with these axioms, he quotes the following cases: (1) In the Hamilton (lord Mountflorenee) family, a daughter, who was supposed uterine life was not more than 168 days. (2) In the Auckland family, the honorable William Frederick Elliot, who was born 173 days after the birth of a sister (who lived 60 years), survived 28 years; although his assumed uterine life was only 159 days. (3) Lord Cecil J. Gordon, brother to the 10th marquis of Huntly, has a son, Cecil-Crosbie, who was born in January 1850 (only 127 days after the birth of a previous child). This son came to maturity, and his assumed period of gestation was only 113 days. "We cannot conceive," says Dr. Bonnar, "how these three cases can possibly be explained except by the doctrine of superfetation;" and Dr. Taylor (*Principles and Practice of Medical Jurisprudence*, page 849) fully adopts his view. Dr. Duncan believes, from anatomical investigations, that up to the third month of gestation, a second conception may follow the first; and he is of opinion that this will satisfactorily account for all the cases of superfetation on record.

SUPERIOR, in Scotch law, means one who, or whose predecessor, has made a grant of heritable property to a vassal, on condition of the latter paying an annual duty or sum of money, generally called a *feu-duty*. The superior is said to have the superiority, or *dominium directum*, and the vassal has the *feu*, or *dominium utile*. In popular language, the superior is a kind of landlord. See **FEU**—In England, the word is not used, though in copyhold estates the term "lord" corresponds to it.

SUPERIOR, LAKE, the largest body of fresh water in the world, is the highest and most western of the great lakes lying between West Canada and the United States. It is situated not far from the center of the North American continent. Its general form is nearly semi-lunar, the outer curve being towards the north. Greatest length from e. to w., 355 m.; greatest breadth, 160 m.; area, about 3,200 sq.m.—fully that of Ireland. The surface of the lake is about 600 ft. above the level of the sea, and its mean depth 1000 ft., so that its bottom is 400 ft. below the level of the sea. Its surface has an elevation of about 22 feet above that of lake Huron and lake Michigan. The greater portion of this rise is at the Sault Ste. Marie, a strong rapid about a mile in length, at the commencement of the river St. Mary, which transmits the waters of lake Superior to lake Huron.

Lake Superior, being situated very near the water-shed between Hudson's bay and the Mississippi, receives no rivers of importance, although hundreds of small rivers pour themselves into it. The largest are the St. Louis river, which falls into its western extremity at Fond du Lac, and is about 110 m. long; and the Neepigon river, on the n. side, which, with the lake of the same name, has a length of about 200 miles. One of the branches of the Mississippi in Minnesota approaches to within 20 m. of the western extremity of lake Superior; and a small lake near the head of the Albany river, of which the waters flow to Hudson's bay, is only 4 m. from a bay opposite the State islands on the northern shore, forming a route with little portage, which has long been

used by the Hudson's Bay company, for the conveyance of goods from lake Superior to the northern country.

The promontory Kee-wee-naw, near the middle of the s. side, projects far into the lake. The islands are not numerous, the largest being Isle Royale, 44 m. long.

The country around lake Superior is generally bold and hilly, with the exception of the peninsula lying between it and lake Michigan; but few of the hills rise more than 1000 ft. above the level of the lake, and most of them are far below this height. On the southern shore, 100 m. w. of the Saute Ste. Marie, are the Pictured rocks, cliffs of gray and red sandstone, from 100 to 200 ft. high, in many places presenting fantastic forms, and marked by numerous perpendicular stripes of red and yellow, from ferruginous waters trickling down the face of the rock.

The boundary between the United States and West Canada, starting from the outlet of the lake at the Sault Ste. Marie, sweeps toward the n., so as to include in the United States even the Isle Royale, which is only 13 m. from the British coast, and strikes inland from the mouth of Pigeon or Arrow river, on the n.w. shore.

The only obstacle to navigation between lake Huron and lake Superior is the Sault Ste. Marie, which is overcome by a canal of about a mile in length, with two locks, on the American side. This is, perhaps, the finest canal in the world. The sides and bottom are lined with stone throughout its whole length, the locks are admirably contrived, and the largest ships can pass through it with ease. The trade is increasing so rapidly that a canal on the British side will also be required at no distant day.

The water of lake Superior is remarkable for its coldness, purity, and transparency, although the affluents on both sides are either turbulent or deeply colored by vegetable matter from swamps and forests.

A rise or fall in the level of the water, amounting to several inches in a few hours, is frequently to be observed along the shore, and has been supposed to be due to a regular tide, but is probably caused by the wind. Fresh water being more easily moved by the wind than salt water, great waves arise in lake Superior with wonderful rapidity; and even in summer, large steamers are compelled to take shelter in some bay, or under the lee of an island. Owing to the low temperature of the water, compared with that of the air, in summer, fogs are prevalent, resting on the water at night, and vanishing an hour or two after sunrise.

Lake Superior never freezes over, but the bays are sealed up in winter, and a rim of ice extends to some distance all around the shore.

The rocks around the lake are very ancient, belonging principally to the Laurentian and Huronian systems of the Azoic series, overlaid in some places, especially on the s. side, with patches of the lower Silurian. The prevalent Laurentian rock is orthoclase gneiss. Among the Huronian rocks are greenstones, slates, conglomerates, quartzites, and limestones. The lower Silurian rocks are soft sandstones. There is everywhere much evidence of glacial action.

The Huronian rocks are well stored with useful minerals. The copper and iron mines of the s. side are celebrated for their extent and richness, and there is every reason to think that the mineral resources of the British side are equal to those of the American, although as yet comparatively undeveloped. The richest copper-mines are situated near Kee-wee-naw point. The metal occurs principally native, and sometimes in single masses of great size. One was met with in 1853, which measured about 40 ft. in length, and was calculated to weigh about 400 tons. Native silver is found associated with the native copper, and sometimes intimately mixed with it. A rich vein in an islet in Thunder bay (British side) yielded in 1870-72 silver to the value of \$1,230,000. Gold has been found in small specks at Nanainse on the British side. Lead ore occurs in some places. The beds of hematite, or red iron ore, at Marquette, on the s. side, are of wonderful extent. The ore is conveyed by a railway to the harbor, thence by vessels to Cleveland, on lake Erie, and thence by rail to Pittsburg, where it is smelted.

The fisheries of lake Superior deserve notice. The delicious white-fish and the gray trout abound, as well as other kinds of fish. The Canadian legislature passed a law in 1835 to put a stop to the wholesale destruction of them on the spawning grounds.

The shores of lake Superior are frequented by bands of the Ojibbeway tribe of aborigines. They are of very pure blood, retain in a great measure their primitive habits, and many of them are still pagans. They seem incapable of adapting themselves to the settled life of the white man.

The white population of the British shore of lake Superior consist as yet only of the fishermen and explorers who visit the region during summer; and of miners, who extract the silver ore from veins recently discovered on Silver island, near Thunder bay. But on the American shore a number of thriving towns have sprung up. All these towns are connected with mines, little attention being yet paid to agriculture. Marquette, near the eastern end of the lake, is connected by a railway with Green bay, on lake Michigan, and thus with Milwaukee and Chicago. A telegraph line has been established.

SUPERPHOSPHATES. See PHOSPHORUS.

SUPERTONIC, in music, the note which, in the diatonic scale, is next above the tonic or key-note, and forms with it the interval of the second, as D in the key of C major.

SUPPLE JACK, a name given in the southern parts of the United States of America to the *berchemia volubilis*, a twining shrub of the natural order *rhannaceæ*, which is found as far n. as Virginia. It has oval leaves, small flowers, and violet-colored berries. It abounds in the Dismal Swamp and in similar situations, and ascends to the tops of the highest trees. The genus *berchemia* contains a number of species of twining shrubs, natives of warm climates in different parts of the world. The name Supple Jack is also given in the West Indies and tropical America to *serjania* (or *seriana*) *tridentata*, a shrub of the natural order *sapindaceæ*, with a long, flexible, woody stem, which climbs to the tops of the highest trees, and is used for walking-sticks. It has poisonous properties, and is employed for stupefying fish.

SUPPLY, COMMISSIONERS OF, persons appointed by the acts imposing the land-tax in Scotland, to assess, and formerly also to collect, that tax. Their principal duty now is to assess the land-tax, and apportion the valuation according to the provisions of the valuation of lands act, 17 and 18 Vict. c. 19. They are entitled to name a convener, who acts as preses of the meeting, and a clerk with a reasonable salary. The qualification, as recently modified by 17 and 18 Vict. c. 91, consists in the being named as an *ex officio* commissioner of supply in any act of supply; or the being proprietor, or husband or a proprietor, of lands of the yearly value of £100; or the eldest son of a proprietor of lands of the yearly value of £400; and a factor of a proprietor of lands of the yearly value of £800 is empowered to act as commissioner of supply in his absence.

By act 17 and 18 Vict. c. 91, the commissioners of supply of every county, and magistrates of every burgh, must cause a valuation roll to be made up yearly, showing the rents of all lands or heritages in the county or burgh, and the names of the proprietors and tenants; and for this purpose, they are empowered to appoint an assessor or assessors. A yearly court is to be held by the commissioners and magistrates, for hearing appeals against the determinations of the assessors, in which three commissioners of supply and two magistrates are to form a quorum, the preses having a casting-vote. See VALUATIONS OF LAND, LAND-TAX.

SUPPLY, COMMITTEE OF. The sums granted in parliament to defray the public expenditure for the current year are called *supplies*. All bills authorizing the expenditure of public money must originate in the house of commons, and be based on resolutions moved in a committee of supply, which is always a committee of the whole house. The house having resolved that a supply be granted to her majesty, resolves itself into a committee of supply. The various estimates are submitted to the committee, which has to consider what specific grants are to be voted; and the resolutions of the committee are reported to the house, and adopted or rejected. It belongs to another committee of the house, the "committee of ways and means," to consider how the sums shall be raised which are voted by the committee of supply. See WAYS AND MEANS, PARLIAMENT.

SUPPORTERS, in heraldry, figures placed on each side of an armorial shield, as it were to support it. They seem to have been, in their origin, a purely decorative invention of mediæval seal-engravers, often, however, bearing allusion to the arms or descent of the bearer; but in the course of time, their use came to be regulated by authority, and they were considered indicative that the bearer was the head of a family of eminence or distinction. The most usual supporters are animals, real or fabulous; but men in armor are also frequent, and savages (q.v.), or naked men, often represented with clubs, and wreathed about the head and middle. There are occasionally but rare instances of inanimate supporters. On early seals, a single supporter is not unfrequent, and instances are particularly common of the escutcheon being placed on the breast of an eagle displayed. The common rule, however, has been to have a supporter on each side of the shield. The dexter supporter is very often repeated on the sinister side, but the two supporters are in many cases different; when the bearer represents two different families, it is not unusual for a supporter to be adopted from the achievement of each.

In England, the privilege of bearing supporters as now defined belongs to the sovereign and princes of the blood, peers and peeresses, and the heads of a very few families not of the peerage, whose right is based on an ancient patent, or very early usage. No right is recognized by the college of arms as belonging to the sons of peers bearing courtesy titles. Knights of the garter and knights grand cross of the bath are dignified with supporters, which, however, are not hereditary. Supporters have also been assigned to the principal mercantile companies of London. In Scotland, the use of supporters is somewhat less restricted. The distinction was much less wide than in England between the greater and lesser barons (see MIXON BARONS), and the right to supporters was considered to belong to the latter, so long as the baronial status conferred a right to sit in parliament. The act of 1587, which finally excluded the lesser barons from the Scottish parliament, and established a systematic parliamentary representation, was not held to interfere with this armorial privilege, and it is yet the practice of the Lord Lyon to grant or confirm supporters to the representatives of all minor barons who had full baronial rights prior to that date. A limited number of heads of important families, including the chiefs of the larger Highland clans, apart from considerations of barony, participate in the right to supporters. Lyon is also considered to have it in his power to confer them *ex gratia*, a prerogative which is but sparingly exercised, one of the instances of such departure from strict rule having been in favor of sir Walter Scott. Nova Scotia

baronets as such have no right to supporters, though many of them bear them in respect of the baronial qualification.

The lion and unicorn, familiar in the royal arms of the United Kingdom, were adopted, the former from the achievement of England, the latter from that of Scotland prior to the union of the crowns.

In the more modern heraldry, supporters generally stand either on an escrol, containing the motto, or, more properly, on a carved panel of no definite form, which in Scotland is known by the name of a *compartment*.

SUPPURATION is a morbid process which gives rise to the formation of pus (q.v.), which, as is well known, is one of the commonest products of inflammation. There are two doctrines as to the origin of pus. The opinion universally adopted till very recently was, that it was formed from an excessive exudation of the fluid portions of the blood through the walls of the capillaries; in which exudation, under certain conditions, pus-cells were developed. This view is now rejected for the doctrine of Virchow, the eminent professor of pathology at Berlin, who maintains that pus-cells are generated from the corpuscles of areolar tissue, which he supposes to permeate nearly every portion of the body. Pus, according to Virchow, is a young tissue in which, amid the rapid development of cells, all solid intercellular substance is gradually dissolved. A single cell of areola or connective tissue may, in an extremely short space of time, produce some dozen of pus-cells; but the result is of no service to the body, suppuration being, to use his own words, "a pure process of luxuriation, by means of which superfluous parts are produced, which do not require that degree of consolidation or permanent connection with one another, and with the neighboring parts, which is necessary for the existence of the body." There are two different modes of pus-formation, according as the pus proceeds from epithelium (q.v.) or from connective tissue (see **CELLULAR TISSUE**). When puss is formed from epithelium, it is produced without any considerable loss of substance, and without ulceration; but when it is formed from connective tissue, ulceration must always exist. The mucous membranes vary in their power of forming pus. A mucous membrane, according to Virchow, is the more qualified to produce pus without ulceration the more completely its epithelium is stratified, those with a single layer of epithelium being less adapted for the production of pus. Thus the intestinal mucous membrane scarcely ever produces pus without ulceration; while other mucous membranes, containing several strata of cells, are capable of secreting enormous quantities of this fluid without the slightest ulceration (as, for example, the urethral mucous membrane in gonorrhea).

The above cases of suppuration occur on free or exposed surfaces, and are unaccompanied with loss of tissue. Deep-seated pus-formation takes place only in connective tissue. The first stage of formation consists in an enlargement of the normal cells, and a division and excessive and rapid multiplication of their nuclei. This is soon followed by division of the cells themselves, and their conversion into true pus-cells. If this process takes place beneath a surface which does not participate in the morbid change, or which is capable of resisting it for a time, an *abscess* is formed; whereas, when pus-cells are poured forth from an exposed surface, we have an *ulcer*.

Although suppuration is a morbid process, it often accompanies processes of a beneficial tendency (such as granulation), and frequently takes the place of other far more morbid processes. It further affords a mechanical means of removing foreign bodies, such as thorns, splinters of glass, etc., from soft parts into which they may have been driven; and it is possible (as some pathologists believe) that the formation of abscesses may sometimes serve to eliminate morbid matters from the system.

SUPRALAPSARIAN (Lat. *supra*, before, *lapsus*, the fall), the name given to the school of divines which maintains that God's absolute decree of election and reprobation is antecedent to his foresight of the fall of Adam, and irrespective of it. See **SUBLAPSARIAN**.

SUPRA-RENAL CAPSULES AND THEIR DISEASES. The supra-renal capsules are two small, flattened, glandular bodies of a yellowish color, situated, as their name implies, immediately in front of the upper end of each kidney. In weight they vary from one two drams. They belong to the class of ductless glands, and on making a perpendicular section, each gland is seen (like the kidney) to consist of cortical and medullary substance. The blood-vessels and nerves of the glands are exceedingly numerous. Of late years much attention has been drawn to the diseases of these organs from the observation of the late Dr. Addison (of Guy's hospital), that such cases are frequently associated with the deposition of pigment in the skin, causing it to assume a deep bronze color. The following definition of Addison's disease, or *supra-renal melasma*, or *bronzed skin disease*, embracing all the most important points in its natural history, is given by Dr. Aitken: "A morbid state which establishes itself with extreme insidiousness, whose characteristic features are anæmia, general languor and debility, and extreme prostration, expressed by loss of muscular power, weakness of pulse, remarkable feebleness of the heart's action, breathlessness upon slight exertion, dimness of sight, functional weakness and irritability of the stomach, and a peculiar uniform discoloration of the skin, which becomes of a brownish olive-green hue, like that of a mulatto, occurring in connection with a certain diseased condition of the supra-renal capsules. The progress of the

disease is very slow, extending on an average over one year and a half, but may be prolonged over four or five. The tendency to death is by asthenia, the heart becoming utterly powerless, as if its natural stimulus—the blood—had ceased to act."—*The Science and Practice of Medicine* (3d. ed. vol. ii. p. 72). The numerous cases recorded by different physicians of all countries since Dr. Addison's original observations were made, show that the connection between *bronzing* of the skin and various morbid states of the supra-renal capsules is a fact beyond all dispute; but the exact relationship and pathological significance of the morbid states thus connected are still open questions. The special morbid changes in the capsules necessary for the production of the symptoms which constitute the disease, are first the deposition of a translucent, softish substance; the degeneration of this to a yellowish-white opaque matter; and afterward a softening into an abscess, or drying up into a chalky mass. In the way of treatment, nothing can be done but attempt to improve the general health by nourishing food, tonics, etc. The literature of this very singular disorder is mainly to be found in various memoirs in the *Guy's Hospital Reports*.

SUPREMACY, ROYAL. The term supremacy is, in politics, chiefly used with regard to authority in matters ecclesiastical. From the time of pope Gelasius (494 A. D.) to the reformation, the pope exercised a very extensive authority, judicial, legislative, and executive, over all the churches of western Europe, somewhat undefined in its limits, varying in different countries and at different periods; which continues to be more or less recognized in all countries whose inhabitants are in communion with the church of Rome. At the English reformation, the papal supremacy was abolished, and act 26 Henry VIII. c. 1, declared the king and his successors to be the "only supreme head on earth of the church of England." A curious document was at the same time drawn up by the government, in which, to avoid misconception, it was explained that the recognition of this headship of the church implies only that the king should have such power as of right appertaineth to a king by the law of God, and that he should not take any spiritual power from spiritual ministers, or pretend to "take any power from the successors of the apostles that was given them by God." In 1535, the same year in which this act was passed, John Fisher, bishop of Rochester, sir Thomas More, and others, were beheaded for denying the king's supremacy; and in 1578, John Nelson, a priest, and Sherwood, a young layman, suffered the punishment of death for the same offense. The assumption by Henry VIII. of the title of "head of the church," notwithstanding the explanation alluded to, was much commented on; and on the accession of Elizabeth, it was thought prudent, while again claiming the supremacy in all causes, as well ecclesiastical as civil, to keep that designation in the background. By successive statutes, the oath of supremacy was appointed to be taken by the holders of public offices along with the oath of allegiance and of abjuration, and these three oaths were consolidated into one by 21 and 22 Vict. c. 48. The subject of oaths was, however, revised by the legislature in 1863 and 1871; and a new short oath of allegiance, in which the royal supremacy in matters ecclesiastical is not in express words specified, was substituted for the oath previously imposed upon members of both houses of parliament. See **ALLEGIANCE** and **OATH**.

SURABAYA, a leading sea-port of Java, and capital of a residency, is situated on the Kedi Mās mouth of the river Kedirie, near the strait of Madura, the citadel being in 7° 4' 30" s. lat., and 112° 40' 40" e. long. The population of the city and suburbs is about 91,000. The European town is on the w. bank, 5 bridges connecting it with the Chinese and Javan quarters on the east. There are 2 Protestant clergymen, a Roman Catholic priest and assistant, 4 government and 6 adventure schools for Christian children. There are regular steamboat services to Samarang, Batavia, and other places. In 1874 the government sugar culture in Surabaja employed 57,114 families, and produced 31,445 tons. The government coffee amounted to 386½ tons. The residency of Surabaja comprises an extensive tract of fertile land in the n.e. of Java, and the island of Madura. On Jan. 1, 1874, the population amounted in all to 1,526,148, including 5,342 Europeans and 10,515 Chinese. Rice, coffee, sugar, indigo, cotton, tobacco, and cocoa-nuts are extensively cultivated.

SURAKARTA, a residency of Java, s.e. from Samarang, with an area of 2,366 sq. m.; is fertile and well cultivated, producing rice, maize, sugar, coffee, tea, indigo, tobacco, pepper, cacao, vanilla, and tropical fruits. In 1874 4,304½ tons of coffee were produced. Pop. 74,823,560, including 1906 Europeans. The people are proud, and less obedient than in the other residencies, but abjectly submissive to the native emperor, though, in many things connected with his government, he must consult the European resident.

Surakarta, the capital of the empire, and seat of the residency, lies on the left bank of the Solo, in 7° 31' 30" s. lat., and 110° 45' 7" e. long., covers a large space, and has a population of over 50,000. Many princes and nobles have their palaces in Surakarta; that of the emperor is of great extent and splendor, 10,000 persons, belonging to, or in the service of the royal family, living within the wall. North-east from the royal park lies the European town, in front of which, surrounded by the parade ground, and commanding the palace, is a square fort, with broad canal and drawbridges at the four corners, and mounted with 30 pieces of heavy artillery. There is a normal school for training Javanese teachers; a government school, with 80 pupils; and an adventure girls'

school, with 40 pupils. A railway was completed in 1870, from Samarang to Surakarta, by which the produce is easily conveyed to the port of shipment, and an impulse given to trade and agriculture.

SURAT' (Sans. *Saurashtra*, good country), a large but declining city of British India, capital of a district of the same name, 150 m. n. of Bombay, and about 17 m. from the mouth of the Tapi, in the gulf of Cambay. It is 6 m. in circumference, and it is surrounded on the landward side by a brick wall. The river at Surat is said to be fordable, although at high tide it can float vessels of 50 tons burden. The English and Portuguese factories, the former now used partly as a lunatic asylum and partly as hospital, are both imposing edifices of great strength and solidity. Surat is said to have contained—but this is probably an exaggeration—800,000 inhabitants at the close of the 18th c., about which time its markets were crowded with the costliest wares, brought by merchants from the remotest countries. Its trade and manufactures, once almost extinct, revived during the American civil war, and it still exports cotton and grain to Bombay. Surat is a place of considerable military strength, and the residence of a British military commandant and other dignitaries. Pop. 71, 107,149.

Surat was long thought to be one of the most ancient cities of Hindustan, but this opinion is now abandoned, and it is believed to have been a mere fishing-village as late as the 13th century. It first rose into importance as the spot whence the Mohammedans of Hindustan embarked on their religious voyage to Mecca. Surat was sacked in 1512 by the Portuguese soon after their arrival in India. In 1612 an English force arrived here in two vessels, under the command of capt. Best, who defeated the Portuguese, and obtained a *firman* from the Mogul emperor, authorizing the residence of a British minister. The Dutch trade with Surat commenced in 1616, when a Dutch factory was established. A French factory was founded in 1668. In the course of time, the English influence began to predominate. In 1759 the castle and fleet were made over to them; and from the year 1800 the government of the settlement has been entirely vested in their hands.

SURBASE. See PEDESTAL.

SURD. See IRRATIONAL NUMBERS.

SURETY. See GUARANTY.

SURFACE GRUB, the caterpillar of the *great yellow underrwing moth* (*triphena pronuba*), a pretty large moth, with the upper wings deep brown or pale tawny, the under wings bright orange with a black border. This moth abounds in hay-fields in Britain at the season of haymaking. The caterpillar, when full grown, is nearly an inch and a half long, pale green with a tinge of brown, dotted with black, three pale lines down the back, and seven black spots on the inside of each of the two outer ones. It often does great mischief to the roots of cabbages and turnips, and also devours the roots of grass.

SURF DUCK, or **SURF SCOTER**, *Oidemia perspicillata*, a species of scoter (q.v.) extremely plentiful on the coasts of Labrador, Hudson's bay, and other very northern parts of America, from which great numbers migrate southward in winter. It is a rare visitant of the coasts of Britain and other parts of Europe. In size it is about equal to the mallard. The plumage is black, except two patches of white on the head and back of the neck. It is never seen on lakes or rivers, but only on the sea-coast. It dives so quickly that it is very difficult to shoot except when on the wing. Its flesh is rank, and has a fishy taste.

SURGEON, ARMY AND NAVY. In the army, surgeon is the grade in which an officer enters the medical department, and from which he is promoted in about 15 years to the rank of surgeon-major. He may be attached to a regiment, or serve with a district hospital; pay and duty being practically the same in either case. The pay rises gradually from £182 10s. to £319 7s. 6d. a year; and the surgeon ranks as a lieutenant for six years, and afterward as a captain. In the medical department of the navy, surgeon is also the junior rank, reckoning for precedence as a sub-lieutenant for six years, and afterward as a lieutenant. The pay varies from £200 15s. a year to £310 5s.

SURGEONS, COLLEGE OF. The present "Royal College of Surgeons of England" dates its origin from the year 1460-61, when Edward IV. "did, at the supplication of the freemen of the mystery of barbers of the city of London using the mystery or faculty of surgery, grant to them that the said mystery, and all the men of the same mystery of the said city, should be one body and perpetual community." In 1500, four masters of surgery were appointed, under the title of "Magistri sive Gubernatores mistere Barbitonorum et Sirurgicorum" (*sic*), and six years after this date the barber-surgeons of Edinburgh were incorporated by a charter from James IV. Although the original charter granted to the company of barbers of London was confirmed by several succeeding kings, many persons practiced surgery independently, and apparently in defiance of the company; and in order to check unqualified persons, it was enacted in the 3d year of Henry VIII. (1511) "that no person within the city of London, or within seven miles of the same, shall take upon him to exercise or occupy as a physician or surgeon except he be first examined, approved, and admitted by the bishop of London, or by the dean of St. Paul's, calling to him four doctors of physic, and for surgery other expert persons in that faculty." Hence arose a company called the surgeons of London. In

the 32d year of Henry VIII. (1540), the company of barbers of London and the company of surgeons of London were united "by the name of the masters or governors of the mystery and commonalty of the barbers and surgeons of London." It was not till the 18th year of George II. (1745) that the surgeons of London were by act of parliament separated from the barbers of London, and made a distinct corporation under the name of "The Master, Governors, and Commonalty of the Art and Science of Surgery of London." In the 40th year of George III. (1800), this company was dissolved, and replaced with their former and additional privileges by "The Royal College of Surgeons of London." A new charter was granted to the college in the 5th year of Victoria (1843), in which it is declared "that it is expedient to create a new class of members, to be called fellows," and "that from henceforth the corporate name or style of the said college shall be THE ROYAL COLLEGE OF SURGEONS OF ENGLAND." Power was given to the council to elect not less than 250, nor more than 300, members of the college to be fellows. These "first fellows" were mainly elected from the London and provincial hospital surgeons. Other fellows might subsequently be elected from the members, "after having complied with such rules and regulations as shall be considered expedient, and after having passed a special examination." Those who are admitted to the fellowship by examination are distinguished in the college calendar by the letters *Ex* being prefixed to their name. By an addition to the charter, obtained in 1852, power was given to the council, subject to certain regulations, to appoint members of 15 years' standing to the fellowship without examination. The college was likewise empowered to test the fitness of persons to practice midwifery and to grant certificates of such fitness; and in 1859 it was similarly authorized to test the fitness of persons to practice as dentists, and to grant certificates of such fitness.

The government of the college is vested in a council of twenty-four persons, including one president and two vice-presidents; and none but fellows of 14 years' standing are eligible as members of council. Three members of council go out annually by rotation, and the vacancies are filled up on the first Thursday of July. There is a board and a court of examiners, each consisting of ten members, including a chairman at the former, and a president at the latter; and as the examiners, who receive large emoluments (the fees to the court of examiners for the professional examination of members for the year ending June 24, 1878, were £10,110 15s.), are elected by the council, whose remuneration is slight, a position in the council is eagerly sought for as a stepping stone to an examinership. Besides the court of examiners, there are special boards of examiners in midwifery, in dental surgery, and in classics, mathematics, and French for the preliminary membership and fellowship examination. There are four professorships in connection with the college—viz., that of human anatomy and surgery, the Hunterian professorship of comparative anatomy and physiology, the chair of surgery and pathology, and that of dermatology. A Hunterian orator is appointed every second year. The college sends a representative to the general council of education and registration. A candidate for the membership of the college is required to pass a preliminary examination in the usual branches of a liberal education. The fee for the anatomical examination is £5, 5s., and that for the surgical, or pass-examination, is £16, 15s., making a total of £22. The fellowship fee is an additional 10 guineas. For details, see the *Calendar of the Royal College of Surgeons of England*.

The museum of the college of surgeons is incomparably the finest museum of its kind in the United Kingdom. The Hunterian collection (see HUNTER, JOHN), which forms its basis, was purchased by a parliamentary vote of £15,000, and presented to the college in 1799. The edifice in Lincoln's Inn Fields (the germ of the present pile of buildings) was completed in 1813. The Hunterian collection was estimated to consist of 13,682 specimens; the total number of specimens was recently reckoned at above 40,000. The library contains 36,000 volumes. Both the museum and library are readily accessible to visitors.

SURGEONS OF EDINBURGH. ROYAL COLLEGE OF, was originally an association of those professing "surgery and barbour-craft," who obtained their first civic charter in 1504, and had it confirmed by James IV. next year. About 1589 began the custom of granting leave to barbers to practice their profession, without admitting them to the full freedom of the incorporation. For a century and a half the members of the craft were sole teachers and almost sole professors of the surgical art in Edinburgh, and contrived to hold their own against the physicians, who, both before and after their incorporation as a royal college in 1681, made efforts to secure authority over the surgeons. In 1637 the surgeons granted the apothecaries a civil status in alliance with themselves; the nominal connection with the barbers was dissolved in 1732. A patent of 1694 settled the relations between the surgeons and the physicians, making amicable terms possible; and in 1778 the surgeons became formally a royal college too. Nevertheless they remained, much against their will, one of the incorporations of Edinburgh, till the act of 1851 dissolved what survived of their civic rights, and set the college free from the galling control of the town council. The college, which in 1879 had more than 410 fellows, sanctions the lectures of a staff of its own members as qualifying for examination candidates for its diploma of licentiate, and appoints a board of examiners. This examination is now usually taken in connection with that for the diploma of the college of physicians.

SURGERY. There can be no rational doubt that surgery (Gr. *cheir*, the hand; *ergon*, work, signifying the manual interference, by means of instruments or otherwise, in cases of bodily injury, as distinguished from the practice of medicine, which denotes the treatment of internal diseases by means of drugs) is as old as man himself. Passing over the very little that is known regarding the state of surgery among the early Egyptians and the Jews, and the skill ascribed to Chiron and other mythical personages among the early Greeks, we may regard the true history of surgery as commencing with Hippocrates, who flourished in the 5th c. B.C. He was acquainted with the ordinary means of counter-irritation, as issues, a kind of moxa, and the actual cautery. He seems to have performed the capital operations with boldness and success; he reduced dislocations and set fractures, but clumsily and cruelly; extracted the fetus with forceps when necessary, and both used and abused the trepan. He did not perform lithotomy, the practice of which seems at that time to have been well known, but to have been confined to a few, who made it their exclusive study. From the time of Hippocrates we may pass over a couple of centuries, when, on the death of Alexander the great, Alexandria became the great school of anatomy, surgery, and medicine. Herophilus and Erasistratus (300 B.C.) were as distinguished for their surgical skill as for their anatomical knowledge. One member of this school, Ammianus, invented an instrument by which he broke down stones in the bladder, thus anticipating by about 2,000 years Civiale's discovery of lithotomy. When the great Alexandrian library was destroyed by fire, Rome became the headquarters of science in all its departments. The early Romans of all ranks held surgeons and physicians in abhorrence, and trusted for cures, even in cases of dislocation and fracture, to spells and incantations. The first regular surgeon who settled in Rome was Archagathus (220 B.C.), a student of the Alexandrian school. At first his skill procured for him a high reputation, but the old prejudices soon revived, and he was banished from the Roman capital. The first Roman surgeon of real merit was Celsus, who flourished at the beginning of the Christian era, who improved the mode of performing lithotomy and amputation, described the operation for cataract, and first recommended the application of ligatures to wounded arteries, for the purpose of arresting hemorrhage. His works contain an exact representation of surgical knowledge up to his own time. Areteus of Cappadocia, who practiced in Rome during the latter half of the 1st c., was the first to employ blisters, using cantharides (as we still do) for that purpose. Rufus of Ephesus, who lived half a century later, first tied an artery which had become aneurismal in consequence of being wounded in venesection. Galen, who practiced in Rome in the latter part of the 2d c., mainly obtained his great reputation by his medical practice. His surgery was confined for the most part to fomentations, ointments, and plasters for external application; to the art of bandaging, and to the employment of complicated machinery in fractures and dislocations. There is little to record for several future centuries. Aëtius, in the 6th c., recommended scarification of the legs in dropsy, tried to dissolve urinary calculi by internal remedies, studied the diseases of the eye, and is the first writer who notices the guinea-worm. Paulus Ægineta, in the 7th c., opened internal abscesses by caustics, improved the operation of lithotomy, described several varieties of aneurism, extirpated the breast, performed laryngotomy and tracheotomy, and was the originator of the operation of embryotomy. His sixth book is regarded as the best body of surgical knowledge previous to the revival of letters. Rhazes, an Arabian, who had charge of an hospital at Bagdad, at the end of the 9th c., was the first to describe spina bifida, but he did not understand its real nature; he characterized the bites of rabid animals, and gave a better account of hernia than any of his predecessors. To Avicenna, who lived a century later, we probably owe the first use of the flexible catheter, and of the instrument now generally known as Hey's saw. Albucasis (died 1122) describes an instrument for the cure of fistula lachrymalis, the removal of tumors by ligatures when the knife is inexpedient, the suture of wounded intestines, the use of the probang in obstruction of the gullet, etc., and is the only ancient writer on surgery who describes the instruments used in each special operation. In 1271 Pitard, an eminent surgeon of his time, laid the foundation of the college of surgeons of Paris. In our own country, Gilbertus Anglicanus, who lived about the beginning of the 14th c., is the first known surgical writer; he was shortly followed by John of Gaddesden, author of the *Rosa Anglica*. In the middle of that century Guy de Chauliac, the first to describe the Cæsarian operation, practiced at Avignon; and contemporary with him was John of Arderne, who is regarded as the first surgeon of his time. During the 15th c. the local application of arsenic for cancer was proposed by Taranta, a Portuguese surgeon practicing at Montpellier; and lithotomy was removed from the hands of itinerant quacks into the department of pure surgery, by Colot, a surgeon to the French court. Moreover, the college of surgeons dates from this century, having been founded in 1460-61; while at the commencement of the next century (1505) the Edinburgh college was founded. The surgery of the 16th c. may be said to be represented by Ambrose Paré (q.v.). His works, first published in 1535, exerted a most beneficial influence on the profession. Toward the close of this century, Fabricius ab Acquapendente (q.v.), to whom we are indebted for the modern trephine, and for the use of the tube in tracheotomy, published his *Opera Chirurgica*, which passed through 17 editions. Early in the 17th c. (1612), a Scotchman named Lowe published *A Discourse*

on the whole Art of Chirurgery; and about 50 years later Wiseman, who has been appropriately termed "the Paré of England," and "the true father of British surgery," flourished. He was sergeant-surgeon to Charles II., and his surgical works, published in 1676, may still be read with interest. He was the first to dispel the dangerous belief that gun-shot wounds were of a poisoned nature, and had consequently to be treated with the most painful kinds of dressing. Contemporary with him were James Young of Plymouth, who first performed the flap-operation in amputation; Scultetus (a German), the author of *Armaamentarium Chirurgicum*; frère St. Cosme, commonly known as frère Jacques, a French monk, who considered himself specially commissioned by heaven to cut for stone, and who has the merit of having converted the tearing into a cutting operation; Rau of Leyden, one of the most successful lithotomists of any age, and a pupil of frère Jacques; and Roonhuijsen, who divided the sternomastoid muscle for wry-neck, and may thus be regarded as the inventor of tenotomy. The 18th c. produced, in England, White, the originator of excision of joints; Cheselden and Douglas, famous as lithotomists; Percival Pott, John Hunter, and Hey of Leeds; in Scotland, Monro, Benjamin Bell, and John Bell; in Ireland, O'Halloran and Dease; in France, Petit and Desault—the former celebrated for his work on diseases of the bones, and the latter distinguished for his improvements in surgical instruments of various kinds; in Germany, Richter and the illustrious Haller; and in Italy, Lancisi, Morgagni, and Scarpa. Moreover, in this century (1784) the royal college of surgeons in Ireland was founded. Never was surgery so brilliantly represented as during the present century. The London medical schools can point with equal pride to the names of Abernethy, Blizard, Brodie, Astley Cooper, Dalrymple (the oculist), Earle, Guthrie and Nissen (the great military surgeons), Aston Key, Liston, Stanley, Travers, Tyrrell (the oculist), Ware (the oculist), James Wilson, and many other nearly equally celebrated surgeons of an earlier date; and to the more recent ones of Arnott, Bowman, Erichsen, Ferguson, Prescott Hewett, Hilton, Lane, Lawrence, Luke, Paget, Spencer Wells, and a host of others. In Edinburgh were sir Charles Bell, Lizars, Miller, Syme (whose name will ever be associated with a special amputation of the foot, and with the operation for stricture), and Simpson, discoverer of the application of chloroform to surgical practice. Among the most recent innovations and improvements in surgical practice may be mentioned the practice of *antiseptic surgery*, with which the name of Joseph Lister is so worthily associated. The principle of prof. Lister's method consists in the exclusion of septic matter—usually existing in the form of germs, and derived from the atmosphere—from raw or wounded surfaces. Wounds are dressed under *carbolic acid* spray, and with other preparations of this and other antiseptic substances, care being taken in dressing the wound to exclude ordinary atmospheric air. The results of this practice have been on the whole surprising; and recoveries from many serious operations have taken place in remarkably short periods, and with an absence of suppuration and other secondary effects of the inflammatory process. Among the surgical celebrities of Dublin must be mentioned Peile, the inventor of Peile's lithotome and staff; Todd (the father of the late eminent Dr. Todd, of London), who was the first to successfully revive the treatment of aneurism by compression; Colles, the first to describe the fracture known as Colles's fracture of the radius; Carmichael, distinguished for his opposition to the indiscriminate use of mercury in syphilis; Bellingham, and Hutton, whose names are associated with the full development of the revived treatment of aneurism by compression; Cusack, Porter, McDowell, and sir Philip Crampton; Adams (well known for his treatise *On the Diseases of the Joints, and Chronic Rheumatism*), R. W. Smith (celebrated for his researches on fractures and neuroma), and Jacob (the discoverer of the *membrana Jacobi*). It would be impossible to mention a tithe of the names of those who have attained high surgical celebrity in the provinces during the present century. The barons Dupuytren and Larrey, and M.M. Amussat, Chassaignac, Civiale, Brasdor, Broca, Desmarre (the oculist), Nelaton, Roux, Siebel (the oculist), Velpeau, etc., have honorably sustained the reputation of French surgery. Beer (the oculist), Chelius, Dieffenbach, Von Gärke (the oculist), Gurlt, Jäger (the oculist), Langenbeck, Stromeyer, and Wutzer, constitute but a small portion of the eminent surgeons of Germany. Callisen of Copenhagen, Porta of Pavia, and Perogoff of St. Petersburg, may be taken as the surgical representatives of their respective countries. Among American surgeons, the names of Valentine Mott, the Warrens, Marion Sims, and Gross deserve special notice. To understand what surgery now is, and to trace its recent progress, the reader should study the standard surgical treasures of Erichsen, Ferguson, Miller, and Syme; and the comprehensive and most valuable *System of Surgery*, edited by Mr. Holmes, and contributed to by many of the most eminent authorities on surgery. He will also do well to read Ferguson's *Lectures on Conservative Surgery*, and Syme's *Address on Surgery*, delivered before the members of the British Association in Aug., 1865.

With the increase of knowledge, specialities naturally develop themselves; and such has been the case in surgery. The diseases of the eye, the diseases of the ear, the diseases peculiar to women, the diseases of children, and deformities (the treatment of which is termed orthopedic surgery), more or less separate themselves, at least in large towns, from general surgery, and constitute special departments, of which dentistry may be considered one; as most of the eminent dentists of the present day are regularly educated and qualified surgeons:

It is deserving of record that within recent years nearly all the British universities have commenced to give surgical as well as medical degrees.

For further information on the history of surgery, the reader is referred to the old histories of Le Clerc (Geneva, 1696) and Freind (Lond. 1725), to Moir's *Outlines of the Ancient History of Medicine*, to Sprengel's voluminous *History of Medicine* (in German), and to the admirable "Historical Notice of Surgery" in the late prof. Miller's *Principles of Surgery*, from which we have borrowed many of the details incorporated in this article.

SURICATE, the *Ryæna capensis*, a carnivorous animal of s. Africa and the cape of Good Hope, sometimes called *zenick*. It belongs to the family *viverridæ*, and is, therefore, allied to the civet (q.v.), genet (q.v.), ichneumon (q.v.), and paradoxurus (q.v.). The generic characteristics are: feet rather long, and toes with robust claws adapted to burrowing habits; tongue furnished with horny *papillæ*; ears small; tail long, slender, and pointed. Dental formula $i \frac{3-3}{3-3}; c \frac{1-1}{1-1}; m \frac{5-5}{5-5} = 36$. The genus *ryæna* resembles

the ichneumons in the tinting and stripes of the coat; but the legs are longer, there are only four toes on each foot, and the dentition differs in not having small molars immediately behind the canine (III). The *R. capensis* is about 2 ft. long, including the tail; fur, a mixture of brown, white, yellowish, and black. The color of the hair is brown at the bottom, black near the tips, and hoary at the points; those on the back undulated; inside of the legs, yellowish-brown; tail, tufted with black. According to Pennant it is called the *meer-rat* at the Cape. It also resembles the ichneumons in habits, and its urine is very fetid. It eats flesh, preys on mice, and devours quantities of cock-roaches. Sometimes it is domesticated for the purpose of exterminating vermin.

SURINAM. See GULANA, DUTCH.

SURINAM BARK. See ANDIRA.

SURMOUNTED, in heraldry, a term used to indicate that one charge is to be placed over another of different color or metal, which may respectively be blazoned: Sable, a pile argent surmounted by a chevron gules; and, argent, a cross gules, surmounted by another or.

SURMULLET, *Mullus*, a genus of acanthopterous fishes of the family *mullidæ*, a small family formerly included in *percidæ*, but distinguished by having two dorsal fins widely separated from one another, the first spinous; and large, easily detached, strongly ciliated scales on the head and body. The genus *mullus* has no teeth on the upper jaw, but a disk of pavement-like teeth on the front of the vomer. Two long barbels hang from the under jaw, or, when not in use, are folded up against it. Only two species are known, both abundant in the Mediterranean, and both found on the British coasts. They very generally receive the name **MULLET**, by which they are confounded with a very different genus. The **STRIPED SURMULLET**, or **STRIPED RED MULLET** (*M. surmuletus*), is sometimes very plentiful on the southern coast of England, but is rarer toward the north. It approaches the shores in summer, and many surmullets are then taken in mackerel nets; but at other seasons it is only obtained from comparatively deep water by trawl-nets. It sometimes attains, in the Mediterranean, a weight of 6 or 7 pounds, but has never been known much to exceed 3 pounds in the British seas, and is seldom more than 2 pounds in weight. The ancient Romans, who held it in the highest esteem, gave prodigious prices for fish of unusually large size. They kept surmullets in their *vivaria*; but there the fish did not increase in size. The color is pale pink, with three or four yellow longitudinal stripes; but where any of the scales have been rubbed off, beautiful tints of purple and bright red appear, which takes place also during the struggles of the fish when dying, and the Romans were therefore accustomed to bring surmullets alive into their banqueting-rooms, that the guests might see them die, and enjoy the brilliant display of color, before eating the fish. The liver was regarded as peculiarly delicious, and was bruised in wine to make a *garum* for the flesh. The surmullet is still regarded as one of the best of fishes.—The **RED SURMULLET**, or **PLAIN RED MULLET** (*M. barbatus*), is very rare on the coasts of Britain. It is a much smaller fish than that already described. Other species of *mullidæ* are found in tropical seas.

SURNAME (either from its being an additional name—Fr. *surnom*, Ital. *soprano*—or from the practice of writing it over the Christian name, which is to be seen in the court rolls and other ancient muniments), in modern Europe, the family name. The Roman *cognomen* partook somewhat of the same character; but the introduction of the surnames of modern time cannot be traced further back than the latter part of the 10th century. See NAME.

SURPLICE (Lat. *super pellicium*, above the robe of fur), a linen or muslin vestment, worn by clerks of all degrees of orders in the discharge of their public religious offices. It is by some supposed to be derived from the longer and more flowing vestment which, in the Roman Catholic church, is still used in the mass, and is called the "alb;" but in that church the surplice is worn not alone by priests, but by all who have been admitted even to the church tonsure. Its most ordinary use is for the service of the choir, and it is also employed, along with the stole, by priests in the administration of the sacraments, and in preaching. The use of the surplice was strongly objected to by the Calvinistic

and Zwinglian reformers on the continent, and by the Puritans in England, who regarded this vestment as a relic of popery, and made it the subject of vehement denunciations. The argument against it is to be found in Beza, *Triclat. Theolog.*, iii. 29, and its defense in Hooker's *Ecclesiastical Polity*, book v., ch. 29. Ere ritualism became so common in England, no little stir used from time to time to be created by the use of the surplice by the preacher in the pulpit, contrary to the more general practice in the Anglican church. Preaching in the surplice has been associated in the popular mind with a Romanizing tendency, although it is difficult to say on what basis this association rests.

SURREY (Sax. *Suth-ricce*, the s. kingdom), an inland co. in the s. of England, bounded on the n. by Middlesex, and on the e. by Kent. Area, 483,178 acres; pop. '71, 1,091,635. The middle of the county is traversed from w. to e. by a well-marked ridge of the North downs, which rises in Botley hill, above Titsey, to the height of 880 feet. On the n. side of this range, the land slopes gradually to the banks of the Thames, which runs along the northern border; but on the s. side, the descent is rugged and broken, affording pleasing and sometimes romantic scenery. S. of the main range, and about 4 m. s. of Dorking, is Leith hill, 993 ft. high, the most important elevation in this quarter of the country. Stretching along the southern bank of the Thames, and extending over a space about 6 m. in breadth, is a tract which belongs to the London clay formation; further s., and likewise extending from w. to e., there is a tract of plastic clay, varying in breadth from 1 to 5 miles. Chalk, weald-clay, and iron-sand formations occupy the s. of the county. The principal streams are the Mole and Wey, tributaries of the Thames. The soil of the northern half of the county is fertile; in the w. and s.w. the land is, to a great extent, covered with heath. The climate is soft and mild in low-lying districts, and is favorable to the production of corn and grass. More than four-fifths of the entire area are under culture. In the n., in the vicinity of London, there are numerous market-gardens, the produce of which is sent to supply the markets of the metropolis. Hops, wheat, and the ordinary crops are raised. The county contains much wood, and the beauty of the scenery, and the facility of communication with London, have attracted many residents to Surrey, which is consequently studded over with mansions and villas. Manufactures are carried on in Southwark and in the other southern suburbs of London, as well as in Croydon, Guildford, Kingston, and Reigate, which are the principal towns. The county returns four members to the house of commons.

SURREY, HENRY HOWARD, Earl of, 1516-47; b. England; son of the third duke of Norfolk. His youth was spent in France, and at the court of Henry VIII. In 1540 and for some years later, he served in France and gained the title of field marshal; he captured Boulogne, was made its governor, and gained other victories, but was recalled to England after some slight reverses at St. Etienne. His influence at court was no longer as powerful as in the life of the duke of Richmond, Henry's natural son; charges of treasonable ambition were constantly urged against the duke of Norfolk and Surrey by the Hertford faction; and in 1546 the two were arrested; Norfolk was sent to the Tower, and Surrey was beheaded, 1547. As a poet he was the first to introduce the sonnet and blank verse in English poetry. He wrote many sonnets, amatory verses, and elegies, and an elegant translation of parts of the *Æneid*.

SURROGATE, an officer having jurisdiction over the personal property of decedents, and often a special jurisdiction over their real estate. The surrogate in England was a representative of the bishop in the diocesan courts, which down to 1857 exercised jurisdiction over the probate of wills, and the issue of letters testamentary and of administration, as well as in matters ecclesiastical. As the bishop could not always hold his court in person, he appointed a "substitute," *surrogatus*, to represent him. Such substitutes, originally ecclesiastics, but in later times lawyers, acted as judges in probate matters; and the court of the archbishop of Canterbury held by his surrogate was the principal court in probate, admiralty, and marriage matters. A separate court of probate and divorce was established in 1857. In New Jersey the surrogate is only an inferior officer of the probate court. In New York there is a surrogate's court in each county held by the county judge, unless the county has more than 40,000 inhabitants, in which case a surrogate is elected for 6 years. See PROBATE.

SURTURBRAND, a kind of brown coal (q.v.) found in the north of Iceland, and there used for fuel. It has a great resemblance to the black oak found in bogs. It is capable of being made into tables and other articles of furniture, but is too brittle to be cut into shavings by a plane.

SURRY, a co. in n.w. North Carolina, drained by the Yadkin and the Ararat rivers; traversed in the n.w. by the Blue Ridge; about 510 sq. m.; pop. '80, 15,301—2,067 colored. The surface is hilly and heavily wooded. The soil is fertile in some portions. The principal productions are corn, tobacco, wheat, and live stock. Co. seat, Dobson.

SURRY, a co. in s.e. Virginia, drained by the James river, which bounds it on the n.e., and by the Blackwater river; about 280 sq. m.; pop. 87,391—4,560 colored. The surface is irregular and heavily wooded. The soil is sandy. The principal productions are corn, peas, and pork. Co. seat Surry Court House.

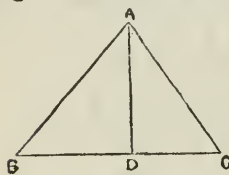
SURVEYING. Land-surveying may be considered the earliest practical application of the art of geometry or earth measurement, and must have been in some more or less

rude form coeval with agriculture and the division or appropriation of the soil. In Rome, surveying was considered one of the liberal arts, and the measurement of lands was intrusted to public officers who enjoyed certain privileges; and it is probable that the system of measurement practiced by them was very similar to our plane surveying with the chain and cross-staff of the present day, and has been handed down to us through the feudal period. An examination of ancient records and title-deeds will show that both areas and boundary-lines of the different inclosures forming fields, hundreds, town lands, etc., are often laid down with a considerable degree of accuracy.

Land-surveying may be considered under the following heads: (*a.*) Plane surveying with the chain, and without the aid of angular instruments, except the cross-staff or fixed angle of 90°. (*b.*) Modern engineering surveying, in which angular instruments are used. (*c.*) Coast and military surveying. (*d.*) Trigonometrical surveying (q.v.).

The fundamental rule of every description of land-surveying, from the humble attempt of the village school-master to lay down an irregular garden-plot, to the trigonometrical survey of a large extent of the earth's surface, when the aid of the most refined improvements of modern science is indispensable, is simply to determine three elements of a triangle, and thence to calculate its area.

In plane surveying with the chain, the three sides of a triangle, ABC, are supposed to be accessible, and are carefully measured on the ground, and then laid down or platted to scale on paper, when an accurate figure of the triangle will be obtained, on which the length of the sides can be marked. To get the area, however, it will be necessary to determine the length of the perpendicular line AD, and this is



usually done (when possible) on the ground by means of a simple instrument called a cross, which consists of two sights or fine grooves at right angles to each other, and being placed on the line BC (keeping B and C visible in one of the sights), nearly opposite the angle A, is moved gradually till the angle A is intersected by the other sight. The line AB can be also laid down on the drawing, and its length found by scale, and afterward verified on the ground, or it may be at once laid down on the ground by the use of the chain alone. An improved reflecting instrument, called an optical square, is also often used for this purpose.

Any boundaries along the lines or sides of the triangle, ABC, can be determined by the use of offsets (q.v.) or insets, as they occur on right and left of line. No matter what the form of the surface to be surveyed may be—polygon, trapezium, or trapezoid—it may thus be determined by a judicious subdivision into triangles; and when the survey is not of a very extended nature or character, and when no serious obstructions exist, chain surveying is both accurate and expeditious, especially if proof or tie-lines are properly introduced, for the purpose of testing the accuracy of the work.

In every description of surveying, it is best to make the original triangle as large as possible, and to work from a whole downward, rather than build up a large triangle by the addition of several small ones. It would be impossible here to lay down rules to meet the many difficulties which arise in the practice of surveying, and indeed the best test of a good surveyor is the ease with which he will overcome local obstructions, which appear almost insurmountable to a novice, or even to a theoretical surveyor with little field practice.

Where buildings or other impediments are found in the measurement of a straight line, they are generally passed by the erection of short perpendiculars sufficient to clear the obstacles, and a line parallel to the original measured as far as they exist, when the original line can be again resumed. Differences of level, occurring in measuring a line where no instruments are used, are generally compensated or allowed for by the judgment of the surveyor.

In registering the dimensions taken on the ground, such as sides of triangles, offsets, intersections of roads, fences, etc., and everything necessary to make a perfect delineation or plan of the surface, surveyors use what is called a field-book, the mode of keeping which varies very much with individual practice. Some surveyors use hand sketches or rough outlines of the form of the ground, and mark the dimensions on them, while others use the ordinary form of field-book, or a combination of the two methods, which perhaps is the best when any difficult complications happen on the ground, such as the frequent occurrence of buildings, enclosures, water, etc., along the line. In the ordinary field-book, the center column, commencing from the bottom, represents the length of any line or side of a triangle; and the figures in the column, the distance at which the offsets to the right or left are taken, or where roads, streams, fences, etc., cross the line, or buildings adjoin the same. We give below the field-book of the assumed survey of the triangle ABC, with the different offsets and insets on its sides, and where roads, fences, streams, etc., cross them, the detail of which can be obtained by subdividing the triangle into smaller internal ones. The figure can thus be

laid down from the book, and its area calculated by the formula $\frac{AB \times CD}{2}$ and the off-

sets and insets calculated, added, or deducted, by the methods given in OFFSETS.

Ponds, plantations, and enclosures of different kinds may be surveyed with a chain,

SURVILLE, MARGUERITE ÉLÉONORE CLOTILDE DE VAILLON-CHALYS DE, 1405-80; is said to be the writer of poems first collected in 1803 by Vanderbourg. Some ascribe them to one of her descendants, the marquis Joseph Étienne de Surville, and others think these poems were written by the publisher Vanderbourg himself.

SUS, a district in Morocco, on the Atlantic ocean, between the Asaka river and the Atlas mountains; about 11,000 sq. m.; pop. about 750,000. The surface is mountainous. The soil is rich. The principal agricultural productions are grapes, figs, olives, almonds, dates, and the ordinary grains and vegetables. Lead and copper are found. The climate is salubrious. The principal city is Tarudant, on the river Sus. The inhabitants of Sus are mostly Arabs or Berbers.

SUSA (Shushan in Daniel, Esther, etc., derived by some from shoshan, a lily), probably the modern Sus or Shush, in lat. 32° 10' n., and long. 48° 26' e., situated between the Chapres or Eulaeus (Ulai in Daniel), and the Shapur, anciently the capital of Susiana (the *E'lam* of Scripture, mod. *Khusistan*), and one of the most important cities of the old world. Its foundation is variously ascribed by ancient writers to Darius Hystaspes, or to Memnon, the son of Tithonus; and its name, together with its ground-plan, is traced on Assyrian monuments at the time of Assur Bani Pal, about 660 B.C. At the time of Daniel's vision "at Shushan in the palace," it was under Babylonian dominion, but came, at the time of Cyrus, under Persian rule; and the Achæmenian kings raised it to the dignity of a metropolis of the whole Persian empire, and as such Æschylus, Herodotus, Ctesias, Strabo, etc., speak of it. At the Macedonian conquest it was still at its height, and Alexander is reported to have found in it vast treasures, together with the regalia. On Babylon becoming the principal city of Alexander and his successors, Susa gradually declined, but seems still to have contained enormous wealth at the time of its conquest by Antigonus (315 B.C.). It was once more attacked by Molo in his rebellion against Antiochus the great; and during the Arabian conquest of Persia it held out bravely for a long time, defended by Hormuzan. The ruins of its ancient buildings, the palace described in Esther among them, cover a space of about three miles. The principal existing remains consist of four spacious artificial platforms above 100 ft. high. Traces of a gigantic colonnade were laid bare by Mr. Loftus, with a frontage of 343 ft., and a depth of 244. Cuneiform inscriptions exist, together with many other relics similar to those found at Persepolis (see PERSEPOLIS; compare also CUNEIFORM). The "tomb of Daniel" shown near Susa is a modern Mohammedan building.

SUSA, a city of northern Italy, province of Turin, stands on the right bank of the Dora Riparia, at the foot of the Cottian Alps, 32 m. w. of Turin. It is an episcopal see, and has a cathedral consecrated in 1038, with a baptistery of one single block of green marble. Among its other notable buildings are the episcopal palace, the town-hall, and the Borgo de' Nobili. The surrounding country produces wines, fruits, mulberry-trees, and wood. The road over Mont Cenis, opened in 1810, begins at Susa. Pop. 3,300.

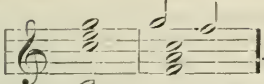
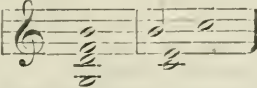
Susa, called by the Romans *Segusio*, is a very ancient city; it was founded by the Celts, and was, in the reign of Augustus, the capital of the Celtic chief Cottius, from whom the Cottian Alps received their name, and during the empire was the starting point for crossing Mont Cenis. A triumphal arch, erected by Cottius in honor of Augustus, still remains.

SUSANNAH, HISTORY OF, *The Judgment of Daniel*, also *Susannah and the Elders*, are the different titles of a well-known story, which forms one of three apocryphal additions to the book of Daniel; the other two being *The Song of the Three Holy Children*, and *The History of Bel and the Dragon* (q.v.). It relates how Susannah, the wife of Joiachim, and daughter of Hilkiah, celebrated alike for her beauty and her virtue, was falsely accused of adultery by certain "lovers," whose advances she had spurned; and how, being condemned to death on their evidence, she was saved by the wise Daniel, who tore the mask from her enemies, and caused them to experience the fate they had designed for her. The question—not a very important one certainly—has been much debated, both in the early and later times of the church, whether or not the story of Susannah is true; and arguments (of various weight) have been adduced to show that the book is a fabrication, a fable, a legend, and a history. The most probable view, perhaps, is that which regards it as a tradition of something that did happen in the life of Daniel, but which has been molded into a moral fiction by the hand of a literary artist. The original is believed to have been Greek and not Hebrew. In most MSS. it precedes the first chapter of the book of Daniel, and so we find it in the old Latin and Arabic versions; but the LXX., the Vulgate, the Complutensian Polyglot, and the Hexaplar Syriac place it at the end of the present book, and reckon it as the 13th chapter.

SUSIANA, an ancient province of Persia, on the Persian gulf; bounded n. by Media, occupying most of the region between the Tigris and the Zagros mountains. The *Elymæi*, supposed to be the Elamites of the Bible, were its earliest inhabitants. The Susii were the dwellers on the plains, and there were many tribes of mountaineers.

SUSPENSION, in music. A note is said to be suspended when it is continued from one chord to another to which it does not properly belong, and to a proper interval of which it must eventually give way. Thus we have here the note G extended from the

first chord into the second, in which it is first suspended, and then resolved into the

chord FACF:  This example is a suspension from above, in which a descent is necessary for its resolution; but a note may also be suspended from below, when it is resolved by an ascent: 

SUSPENSION AND INTERDICT, in Scotch law, is a process by which the suspender, who initiates the proceeding, seeks to stop or interdict some act, or to prevent some encroachment on property or possession, or in general to stay any unlawful proceeding. The first step is to present a note of suspension and interdict to the lord ordinary, who grants *interim* interdict either with or without caution, and orders the note to be answered, or refuses interdict. When the note is answered, the lord ordinary passes or refuses the note, and continues or recalls the interdict as the case may be.

SUSPENSION BRIDGE, a village in w. New York, a port of entry in Niagara co.; pop. '70, 2,276. It is on the Niagara river, nearly opposite the lower rapids, 2 m. below the cataract, at a junction of a branch of the New York Central railroad with the Great Western of Canada, which cross the river on a suspension bridge more than 800 ft. long, and 240 ft. above the water. The first work was done on the bridge in 1852; the first locomotive crossed in 1855. It has 821 ft. span, is 24 ft. wide, and contains 400 tons of iron combined with 600 tons of wood. The railway bridge is 18 ft. above the bridge used for carriages and foot passengers. An important trade with Canada passes through this port. In one year the exports and imports amounted to \$12,649,729, and the duties collected to \$491,785.48. It is the seat of De Veaux college, and contains six churches, several hotels, a newspaper, a stone custom-house and post office. It owes its prosperity largely to the number of tourists attracted by the falls.

SUSPENSION BRIDGES. In these bridges the roadway is suspended from chains passing over piers or towers, and firmly fixed at their extremities. When the roadway is equally loaded over its length, the curve of the chain is a parabola. The weight of the roadway being known, the strain upon the chain, and its requisite strength, are readily determined. For example, in fig. 1, if A be the center of the bridge,



FIG. 1.

of the length of the chain will support this vertical load. By the principles of mechanics, if we draw a right-angled triangle BCD, of which the side BC is a tangent to the curve at B, CD is vertical, and BD horizontal; and if the length of CD represent numerically the load on AB, then BC will represent numerically the strain on the chain produced by that load, and BD will be what is called the horizontal component of this strain. This horizontal part of the strain is the same for every part of the curve; it is the total strain on the chain at the center A, and the strain carried over the towers and balanced by the backstays, which are firmly anchored to the ground behind them. In this manner the conditions of strength and stability of a bridge uniformly loaded are easily determined, but when we have a rolling load which is heavy in proportion to the weight of the bridge, as for example a railway train, the case is very different, for when the train only occupies one half of the bridge, the chain will be depressed toward that side, and raised at the center; thus an undulation will be produced in the bridge, which, if the train be moving rapidly, would endanger its stability. Various combinations have been devised to overcome this difficulty. The most simple, and practically the best, is to stiffen the roadway so that the strain of the passing load is distributed over a considerable length of the chain. In this manner large railway bridges have been constructed in America; among them is that over the Niagara above the falls, with three lines of rails on it, of which the span is 822 ft., and the height of the platform above the river, 250 feet; it is supported by four wire cables, each containing 3,640 wires. Trains pass over it at the rate of 10 m. per hour. An ordinary suspension bridge is liable to both vertical and horizontal oscillations, the former taking place when a train or other load is passing over it, and the latter being due to the action of the wind. These oscillations cannot be altogether prevented, but can be so reduced as to be harmless by the use of stays, stretching both from the towers and from points on shore to various parts of the bridge. Suspension bridges are generally used in positions where the span is great, and the rolling loads neither great in proportion to the weight of the bridge itself, nor very rapid in their motion. Many beautiful examples are to be seen in this country; among others, we may instance the Menai bridge, 580 ft. span, and the Clifton bridge, near Bristol, 703 ft. span.

SUSPENSION OF ARMS. See TRUCE.

SUSQUEHANNA, an American river, which has its origin in Otsego and Canandaigua lakes, in western New York, and, flowing eastward, receives the rivers Unadilla and Chenango, then, turning south, enters Pennsylvania, where it receives the Pittston, the Tioga, the West Branch, and the Juniata, and empties itself into the Chesapeake bay, at Havre de Grace, Md., 400 m. from its source, and 153 from its junction with the West Branch. It is a shallow, rapid, mountain river, with varied and romantic scenery. A canal follows its course, and great quantities of timber are floated down in the spring freshets. Near the mouth it is famous for water-fowl, especially the canvas-back duck, and has important fisheries.

SUSQUEHANNA, a co. in n.e. Pennsylvania, adjoining New York; drained by the Susquehanna river and several creeks; traversed by the Delaware, Lackawanna and Western, and the Erie railroads; about 850 sq.m.; pop. '80, 40,357—36,743 of American birth, 219 colored. The surface is uneven but not rugged. There are fine dairy and stock-breeding farms; oats, corn, wheat, potatoes, butter, and cattle are staples. Co. seat, Montrose.

SUSRUTA is one of the great medical authorities of ancient India. See *Medicine*, under SANSKRIT LITERATURE. His work is called *Ayurveda*, and consists of six books. It was edited by Sri Madhusūdana Gupta, in 2 vols. (Calcutta, 1895-96).

SUSSEX, a co. in s. Delaware, adjoining Maryland, bounded on the e. by the Atlantic ocean and the Delaware river; drained by Indian and Nanticoke rivers, and Mispillion creek; traversed by the Delaware and the Junction and Breakwater railroad; about 950 sq.m.; pop. '80, 36,031—5,698 colored. The surface is level and heavily wooded. The soil is generally fertile. The principal productions are corn, wheat, and cattle. Co. seat, Georgetown.

SUSSEX, the n.e. co. of New Jersey, bordering on New York, separated from Pennsylvania on the w. by the Delaware river; 600 sq.m.; pop. '80, 23,553. The surface is hilly, and the soil very fertile. This county produces the largest amount of butter of any in the state. It contains large deposits of iron, zinc, slate, limestone, and franklinite—a rare mineral. Co. seat, Newton.

SUSSEX, a co. in s.e. Virginia, drained by Stony creek, Nottaway and Blackwater rivers; 420 sq.m.; pop. '80, 10,062—10,032 of American birth, 6,701 colored. It is intersected by the Petersburg and Weldon, and the Atlantic, Mississippi and Ohio railroads. Its surface is hilly and largely covered with forests, which supply the lumber which is the principal source of revenue. The soil is fertile, producing grain, tobacco, and dairy products. Co. seat, Sussex Court House.

SUSSEX (South-Saxons), a maritime co. in the s. of England, bounded on the n. by Surrey and Kent, on the s. by the English channel, and on the w. by Hampshire. Area, 936,911 acres; pop. '71, 417,456. The South downs (see Downs) traverse the county from w. to e., ending about 20 m. e. of Brighton, in the lofty cliff of Beachy head. The northern escarpment of the Downs is precipitous, but leads down to the fertile and richly wooded district of the Weald (see Downs). A remarkably productive tract, from 2 to 7 m. in breadth, extends w. from Brighton along the coast to the Hampshire border; and in the s.e. of the county the rich marsh lands that line the coast, and which are 30,000 acres in extent, make excellent pasture-grounds. Of the Down-land there are about 50,000 acres, covered with a fine, short, and delicate turf, on which the well-known breed of Southdown sheep, to the number of 300,000, are pastured. Of the Weald district, which formerly was covered with dense forests, there are within the county 425,000 acres; a considerable tract has been brought under cultivation. Irrespective of the less productive districts, there are in the county 120,000 acres of rich arable land; 150,000 acres are occupied by woods, which abound chiefly in the Weald, and in the forest ridge in the n.e. of Sussex, where are St. Leonard's forest (10,000 acres), and Ashdown forest (1800 acres). The chief rivers are the Arun, Adur, and Ouse, which have their origin in the n. of the county, and flow s. into the channel. In the s. of Sussex the climate is mild, and several large towns (see BRIGHTON and HASTINGS) are largely resorted to by those who seek health or relaxation. Scaford and Pevensey bays are much frequented by vessels, and the e. portion of the coast is defended by martello towers. The county has for centuries been divided into the six rapes of Lewes, Pevensey, Hastings, Chichester, Arundel, and Bramber. It returns four members to parliament. Capital, Chichester.

SUSTENTATION FUND, a fund provided in the Free church of Scotland for the support of the ministers of the church. The idea of such a fund was probably derived by Dr. Chalmers from the system of the Wesleyan Methodists, and a scheme devised by him was made public before the disruption, so that arrangements had been made, and a small sum already collected, when that event took place. The scheme was afterward carried into operation throughout the whole of Scotland, and continues unmodified to the present time. The members of the church are called upon to contribute, according to their own will and ability, to a common fund; of which, after payment of expenses, payments to a fund for widows and orphans, pensions to retired ministers, etc., an equal division is made among the ministers of the church, with a few exceptions, chiefly in the

case of newly formed congregations. The amount of the fund has gradually increased from £68,704 in 1843-44, to £166,427 in 1877-78, when 776 out of 1075 ministers received an equal dividend of £157, the surplus being divided among the ministers (724) of those charges whose contributions amounted to a certain average sum per member. Congregations are permitted to supplement the stipends of their own ministers, and if able are expected to do so. The supplement in some congregations in towns much exceeds the dividend from the fund; but in many parts of the country, the whole, or almost the whole stipends of the ministers are derived from it. The question had been much discussed, whether an equal dividend ought to be made, or a proportion established between the liberality of a congregation and the amount paid to its minister. The subject of the sustentation fund is of interest, not only to the Free church of Scotland, but to all unendowed churches.

SUTHERLAND, a co. in the extreme n. of Scotland, is bounded on the e. by Caithness and the North sea, on the n. and w. by the Atlantic, and on the s. by Ross and Cromarty. Area, 1,207,189 acres; pop. '71, 23,686, or 12½ per sq. mile. The coast-line is 60 m. in extent; and the shores, rugged on the n. and w., where they are broken by the force of the Atlantic, are comparatively flat on the east. The southern and central regions of Sutherland are the most elevated; and rivers, mostly from the middle of the county, flow e. and s.e. to the North sea, and n., n.w., and w. to the Atlantic. The principal mountain peaks are Ben More in Assynt (3,243 ft.), and Ben Clibrigg (3,158 ft.). The chief rivers are the Oikel and the Shin—which, with other affluents, unite to form Dornoch firth—the Brora, Helmsdale Water, and Naver. Extensive moors, the haunt of herds of red deer, stretch across the county; and the rivers and lakes, the chief of which is loch Shin (q.v.), form numerous low-lying valleys or straths. In the interior and western districts, the climate is cold, and the county is often deluged with continuous rains; but in the eastern districts the climate is mild, and the soil very fertile in all agricultural produce. In 1876 there were 23,346 acres under crops, of which 10,583 acres were under corn, 5,058 acres green crops, 6,691 clover and other artificial grasses, and 6,018 acres permanent pasture. The number of cattle in the same year was 13,057; sheep, 223,503; and swine, 1239. Coal, granites of various colors, marble, limestone, etc., are found. In Nov., 1868, traces of gold were found in a burn in Sutherland. A number of "diggers" were attracted to the district, but the gold found, though of excellent quality, was hardly sufficient to repay their labor. The Highland railway passes through the county. Manufactures are inconsiderable. There are good salmon, herring, and white fishings. Sutherland is well supplied with churches. The schools are well attended, and Gaelic is rapidly giving way to English. Almost the whole of the county belongs to the duke of Sutherland. The present duke is eminent for the zeal with which he has devoted himself to the improvement of Sutherland, spending large sums in the reclamation of land by steam-plows, the construction of railways, etc.

Sutherland receives its name from the Northmen, who frequently descended upon and pillaged it prior to the 12th c., and called it the southern land, as being the limit on the s. of their settlements. The condition of the people of Sutherland before 1811, in which year the county began to be opened up by roads, was miserable. Their sustenance, dependent mostly upon their half-starved flocks, was very precarious, and would have failed them often had not charity administered relief. A former duke of Sutherland effected what are known as the "Sutherland clearances," by compelling such of his tenants as could not support themselves, owing to the unsuitability to agricultural purposes of the districts upon which they dwelt, either to remove to more fertile districts, where they received land at a merely nominal rent, or to emigrate at his expense to Canada.

SUTHERLAND, GEORGE GRANVILLE WILLIAM SUTHERLAND-LEVESON-GOWER, Duke of Sutherland; b. England, 1828; succeeded to the dukedom on the death of his father, the second duke of the name, 1861. His mother, Harriet Elizabeth Georgiana, 1806-68, daughter of the earl of Carlisle, was noted for her beauty and as the patroness of the English anti-slavery society and of other movements of reform and benevolence. The present duke was a member of the house for 10 years before his elevation to the peerage, has immense estates in Sutherlandshire, Staffordshire, Shropshire, and Ross-shire. At the present time (May, 1881), he is on a visit to this country, mainly for the purpose of examining our railroad system.

SUTLEJ, or **SUTLEJ**, an important river in the n.w. of India, the eastmost of the five rivers of the Punjab, rises in the sacred lakes of Manasarovara and Rawan-Irard in Thibet, lat. 30° 45' n. long. 81° 15' east. At its outfall from lake Manasarovara, at between 19,000 and 20,000 ft. above sea-level, it is a rapid torrent 30 ft. broad. It flows n.w. for 150 m., when turning to the s.w. it receives the Spiti or Li, a larger stream than itself. The Spiti is 8,592 ft. above sea-level, when it joins the Sutlej, and the scene of the confluence of the two rivers is sublime in the highest degree. Continuing a s.w. course, the Sutlej breaks through the mountain-rampart of the Himalaya, and after flowing in all about 850 m., in the course of which it is joined by the Beas and the Chenab, it falls into the Indus in lat. about 29° north. Its upper course is supposed to be identical with the Hesudrus, and its lower course (in which it is called the Ghara) with the Hyphasis of the ancients.

SUTLER, is a vendor of provisions allowed by the quartermaster-general to follow an army in the field, for the purpose of supplying the soldiers with such luxuries as they can afford to purchase. Sutlers are under martial law, accompany the baggage on a march, and are narrowly watched, and severely punished if found guilty of any irregularities toward either the soldiers or inhabitants of the country. In the French army a soldier in each regiment is licensed to act as sutler, and is called *vivandier*. See also **CANTEEN**.

SŪTRA (from the Sanskrit *śiv*, to sew, literally, therefore, a thread or string) is, in Sanskrit literature, the technical name of aphoristic rules, and of works consisting of such rules. The importance of the term will be understood from the fact, that the *groundworks* of the whole ritual, grammatical, metrical, and philosophical literature of India are written in such aphorisms, which therefore constitute one of the peculiarities of Hindu authorship. The object of the Sūtras is extreme brevity; and, especially in the oldest works of this class, this brevity is carried to such an excess, that even the most experienced would find it extremely difficult, and sometimes impossible, to understand these aphorisms without the aid of commentaries, which, however, are fortunately never wanting, wherever a work is written in this style. Though there is no positive evidence as to the cause or causes which gave rise to this peculiarity of Hindu composition, the method of teaching in ancient India—an account of which is afforded in some of the oldest works—renders it highly probable that these Sūtras were intended as memorial sentences which the pupil had to learn by heart, in order better to retain the fuller oral explanation which his teacher appended to them. But it is likewise probable that this method of instruction itself originated in the scarcity or awkwardness of the writing material used, and in the necessity, therefore, of economizing this material as much as possible; for that writing was known and practiced at the remotest period of Hindu antiquity, is now placed beyond a doubt, though a startling theory was propounded, some years ago, to the effect that writing was unknown in India, even at the time of the great grammarian Pāṇini. The manner, however, in which, up to this day, the Hindus are in the habit of keeping the leaves of their books together, seems to throw some light on the name given to this aphoristic literature. The leaves—generally narrow, and even at the present time often being dried palm leaves, on which the words are either written with ink or scratched with a style—are piled up, and, according to the length of the leaves, pierced in one or two places, when, through the hole or holes, one or two long *strings* are passed to keep them together. The name of Sūtra was probably, therefore, applied to works, not because they represent a thread or string of rules, but on account of the manner in which these works were rendered fit for practical use; just as in German a volume is called *band*, from its being “bound.” That a habit deeply rooted outlives necessity, is probably also shown by these Sūtra works; for while the oldest works of this class may be called Sūtras by necessity, there are others which convey the suspicion that they merely imitated the Sūtra style after the necessity had passed away, more especially as they do not adhere to the original brevity of the oldest Sūtras; and the Sūtras of the Buddhists (see **PITĀKA**), conspicuous for their prolixity, could scarcely lay claim to the term, if compared with the Sūtra of the Brahmanical literature.

SUTRO TUNNEL. See **TUNNEL**.

SUTTEE' (an English corruption from the Sanskrit *sati*, a virtuous wife) means the practice which prevailed in India, of a wife burning herself on the funeral pile, either with the body of her husband, or separately, if he died at a distance.

The practice of suttee is based by the orthodox Hindus on the injunctions of their Sāstras, or sacred books, and their can be no doubt that various passages in their Purāṇas (q.v.) and codes of law *countenance* the belief which they entertain of its meritoriousness and efficacy. Thus, the *Brahma-Purāṇa* says: “No other way is known for a virtuous woman after the death of her husband; the separate cremation of her husband would be lost (to all religious intents). If her lord die in another country, let the faithful wife place his sandals on her breast, and, pure, enter the fire. The faithful widow is pronounced no suicide by the recited text of the *ṛigveda*.” Or the code of *Yājñika*: “Learn the power of that widow who, learning that her husband has deceased, and been burned in another region, speedily casts herself into the fire,” etc. Or the code of *Angīras*: “That woman who, on the death of her husband, ascends the same burning pile with him, is exalted to heaven, as equal in virtue to Arundhati (the wife of Vasishtha). She who follows her husband (to another world) shall dwell in a region of joy for so many years as there are hairs on the human body, or 35 millions. As a serpent-catcher forcibly draws a snake from his hole, thus drawing her lord (from a region of torment), she enjoys delight together with him. The woman who follows her husband to the pile expiates the sins of three generations on the paternal and maternal side of that family to which she was given as a virgin. . . . No other effectual duty is known for virtuous women, at any time after the death of their lords, except casting themselves into the same fire. As long as a woman (in her successive transmigrations) shall decline burning herself, like a faithful wife, on the same fire with her deceased lord, so long shall she be not exempted from springing again to life in the body of some female ani-

mal. When their lords have departed at the fated time of attaining heaven, no other way but entering the same fire is known for women whose virtuous conduct and whose thoughts have been devoted to their husbands, and who fear the dangers of separation." See for other quotations, H. T. Colebrooke, *Digest of Hindu Law*, vol. ii. p. 451, ff. (Lond. 1801); and his "Essay on the Duties of a faithful Hindu Widow," reprinted from the *Asiatic Researches*, in his *Miscellaneous Essays*, vol. i. (Lond. 1837). But however emphatically these and similar passages recommend a wife to burn herself together with her deceased husband, it should, in the first place, be observed, that *manu*, who among legislators of ancient India, occupies the foremost rank, contains no words which enjoin, or even would seem to countenance, this cruel practice; and, secondly, that no injunction of any religious work is admitted by the orthodox Hindus as authoritative, unless it can show that it is taken from or based on, the revealed books, the Vedas (see SRUTI). An attempt has of late years been made by râjâ Râdhakânt Deb, to show that, in a text belonging to a particular school of the black Yajurveda (see VEDA), there is really a passage which would justify the practice of suttee; but in the controversy which ensued on this subject between him and the late prof. H. H. Wilson, it clearly transpired that the text cited by the learned râjâ is of anything but indubitable canonicity; moreover, that there is a verse in the rigveda which, if properly read, would enjoin a widow not to burn herself, but, after having attended the funeral ceremonies of her husband, to return to her home, and to fulfill her domestic duties; and it seems, at the same time, that merely from a misreading of a single word of this verse from the rigveda, that interpretation arose which ultimately led to a belief and an injunction so disastrous in their results. See H. H. Wilson, "On the supposed Vaidik Authority for the Burning of Hindu Widows, and on the Funeral Ceremonies of the Hindus," reprinted from the *Journal of the Royal Asiatic Society*, vol. xvi., in his works, vol. ii., edited by Dr. Rost (Lond. 1862). That an immense number of widows have fallen victims to this erroneous interpretation of the oldest Vedic text, is but too true. Some fifty years ago, however, the East India company took energetic measures to suppress a practice which it was perfectly justified in looking upon as revolting to all human feelings, and which it would have likewise been entitled to consider as contrary to the spirit of the Vedic religion. This practice may now be said to have been successfully stopped; for though, from habit and superstition, even nowadays cases of suttee occur, they are extremely rare, and all reports agree that the enlightened natives everywhere, except, perhaps, in certain native states, support the action of government to repress this evil of bygone times.

SUTTER, a co. in n. central California; drained by the Sacramento and Feather rivers; traversed by the Oregon division of the Central Pacific railroad; about 680 sq. in.; pop. '80, 5,159—4,201 of American birth. The surface is mostly level prairie, without timber. The soil is fertile. Wheat, barley, wool, wine, and fruits are the principal productions. Co. seat, Yuba Dam.

SUTTER, JOHN AUGUSTUS, 1803-80, b. Baden; an officer in the Swiss service, who emigrated to this country in 1834, and became a trader at Santa Fé. In 1838 he made his way to the Pacific coast, thence to the Sandwich islands, and thence to Alaska, on his voyage from which down the coast, he was wrecked in San Francisco bay in 1839. Obtaining a grant of Mexican land, he established in 1841 a settlement called New Helvetia, where the city of Sacramento now stands. He was governor of the n. district of California under the Mexicans, and alcalde and Indian agent after it passed to the United States. In Feb., 1848, while enlarging his saw-mill race, he discovered gold. The discovery, however, brought him disaster. Gold diggers pre-empted his lands, and besides an annual pension of \$3,000, he received nothing else. He settled in Pennsylvania in 1873.

SUTTON, AMOS, 1798-1854, b. Kent, England; in 1824 became a missionary to India where nearly all his life was spent. He compiled various text books in the Oriya language, and translated the Bible and many tracts into the same tongue. He also published a hymn book and several religious books in English.

SUTURE (Lat. *sutura*, a seam) is a term employed both in anatomy and surgery. In anatomy, it is used to designate the modes of connection between the various bones of the cranium and face. A suture is said to be *serrated*, when it is formed by the union of two edges of bone with projections and indentations (like the edge of a saw) fitting into one another. The coronal, sagittal, and lambdoidal sutures (see SKULL) are of this kind. A suture is termed *squamous*, when it is formed by the overlapping of the beveled (or scale-like) edges of two contiguous bones. There are also the *harmonia* and *septa anglos* sutures, the former being the simple apposition of rough bony surfaces, and the latter being the reception of one bone into a fissure of another.

In surgery, the word suture is employed to designate various modes of sewing up wounds, so as to maintain the opposed surfaces in contact. As it may fall to the lot of any person, on an emergency, to have to sew up a wound, the following general rules, applicable to all forms of suture, should be attended to. In passing the needle, the edges of the wound should be held in contact with the fore-finger and thumb of the left hand; and the needle should penetrate the surface at about an angle of 50° (rather more

than half a right angle), and should, at least, pass through the whole thickness of the skin at each stitch. The distance from the edge of the wound at which each stitch should enter and leave the skin, must vary with the depth of the wound; but there should never be less than the eighth of an inch between the margin of the wound and the entrance or exit of the needle. Sutures should not include vessels, nerves, muscles, or tendons. The line of the thread should cross that of the wound at right angles. For incised wounds on the surface of the body, when the edges can only be transfixed from the cutaneous surface, or when the opposite margins can both be traversed by one plunge, a curved needle (such as a common packing-needle) is most convenient, whereas a strong straight needle is more convenient for the completely free margins of extensive wounds, such as are left after amputation. Various forms of needles are used by surgeons. In the *twisted suture*, as used in the operation for hare-lip, the wound is transfixed by pins, around which, beginning with the uppermost, a thread is twisted.

SUVOROF, ALEXANDER VASSILIVITSII, Count, Prince Italiiski, a Russian field-marshal, and the most famous of Russian generals, was descended from a family of Swedish origin, and was born in Finland, Nov. 13 (O. S.), 1729. His father, who was an officer of the Russian army, and rose, in after times, to the rank of general and senator, enrolled young Suvorof at the age of 13, in the Semenof regiment, where he remained till 1754, when he was promoted to the grade of lieutenant. Suvorof was present in the Russian army engaged in the seven years' war (q.v.), and for distinguished behavior at Kunersdorf, received the grade of colonel. By a constant succession of eminent services in the Polish civil war (1763), in the war against the Turks (1773-74), in suppressing internal disturbances, and in subduing the Tartars of the Kuban (1783), he continued to grow in reputation, and rose to the rank of general. In the Turkish war (1787-92) he was commander-in-chief, for the first time brought the bayonet prominently into use in the Russian army, and decided by it the bloody battle of Kimburn (1787), which would otherwise have been a total rout. At the siege of Otchakof (1788), where he narrowly escaped being made prisoner, the battle of Fokshany (Aug. 1, 1789), which he gained in conjunction with the Austrians, and the decisive victory of Rymnik (Sept. 22, 1789), his headlong bravery, and peculiar system of rapid and repeated attack by overwhelming numbers, secured him complete success. For this last victory, which saved the Austrians under Coburg from annihilation or capture, Suvorof was created, by the emperor Joseph II., a count of the empire, and from his own sovereign received the title of count *Suvorof-Rymnikski*. His last great achievement, and the one which has given a predominant coloring to Suvorof's reputation in western Europe, was the capture of Ismail (q.v.). Suvorof's report of his success was couched in the following terms: "Glory to God and Your Excellency; the town is taken; I am in it." He was then appointed (1791) governor of the newly conquered provinces; was afterward sent (1794) to complete the annihilation of the Polish monarchy, which he effected by repeated victories over the Polish armies, the capture of Praga by storm, and the *repossession* of Warsaw (Nov. 19), where a horrible massacre of the inhabitants took place. The grade of field-marshal, and presents of rare value, rewarded these successes. Under Paul, he fell into disgrace (1795), from his impatience of the emperor's fantastic military regulations, and was deprived of his rank; but being restored through English influence, he commanded the Russian auxiliary army sent to co-operate with the Austrians in Italy. In April, 1799, he reached Verona; compelled Moreau to retire behind the Adda with immense loss, including more than 8,000 prisoners; entered Milan in triumph (April 29); again defeated the French under Macdonald, after a desperate three days' conflict, at the Trebbia (June 17-19), and a third time at Novi (Aug. 15), depriving them of the whole of northern Italy. His campaign in Switzerland, which promised to bring him face to face with Massena, then the best general in Europe, was rendered abortive by the tardiness of the Austrians, and the Russians, in spite of Suvorof's remonstrances, were soon after recalled. His escape from the Schackenthal, where he was hemmed in by the French, is considered by many to be the most brilliant and daring retreat ever executed. While on his return to St. Petersburg, where a brilliant reception was awaiting him, he fell dangerously ill in Lithuania, and though, on his recovery, he found himself a second time in disgrace, he continued his route, and arrived privately in the capital, where he died sixteen days afterward, May 17, 1800. His remains were honored with a magnificent funeral, and the czar Alexander erected a statue to his memory on the Champ-de-Mars. This most extraordinary man had naturally a weak constitution, but rendered it almost invulnerable by exercise, strict temperance, and the regular use of cold baths. His mode of life was of Spartan simplicity, and though the oddity of many of his habits seemed only calculated to encourage ridicule, they, in combination with his paternal care of his men, gave him a powerful hold on the affections of an army at once so ignorant and so thoroughly national in sentiment as the Russian. Suvorof, was inflexible in his resolutions and promises, and of incorruptible fidelity. His skill as a general has often been doubted, on the strength of his favorite remark, that all military tactics could be expressed in three words, *stoupai i bi*, "forward and strike;" but his career shows him to have been possessed of all needful military knowledge—though he hated idle maneuvering—and to have excelled in promptitude and ingenuity of conception, and boldness and rapidity of execution.

SUWAN'NEE, a co. in n. Florida, drained by the Suwannee, which bounds it on the w. and s.w.; intersected by the Jackson, Pensacola and Mobile railroad; about 700 sq. m.; pop. '80, 7,162—7,125 of American birth, 3,140 colored. The surface is mostly level. The soil is sandy. The principal productions are cotton, corn, and sugar. Co. seat, Live Oak.

SUZERAIN (Fr. from Lat. *supremus*), a feudal lord. According to the feudal system, as developed in northern Europe, every owner of allodial (q.v.) lands was compelled to acknowledge himself the vassal of a suzerain and do homage to him for his lands. The term was applied less to the king than to his vassals, who had sub-vassals holding of them.

SVENIGOROD'KA, a t. of Russia, in the government of Kiev, 150 m. s. from Kiev, on an affluent of the Southern Bug. Pop. '67, 11,201.

SWABIA, **SUABIA** (Ger. *Schwaben*), or **SUEVIA**, an ancient duchy, in the s.w. of Germany, so named from a horde of Suevi, who spread over it in the 5th c., and amalgamated with the Alemanni, its previous inhabitants. It existed as a great duchy of the Frank empire till the 8th c., when Alsace and Rhetia were separated from it, and the remainder, retaining its name of Swabia, was thenceforth governed by *nuntii camerae*, or royal delegates, one of whom having, in 915, usurped the title of duke of Alemannia, was condemned by the German diet and decapitated in 917. Swabia at this time was bounded on the w. and s. by the Rhine, on the e. by the Lech (which separated it from Bavaria) and Franconia, n. by the palatinate of the Rhine and Franconia, and contained about 13,000 English sq. miles. In 918, however, Swabia was acknowledged as a ducal fief of the empire; and, after changing hands several times, was (1080) bestowed upon count Frederiek of Hohenstaufen (q.v.), the founder of the illustrious house of this name, also known as the house of Swabia. Under the rule of this prince and his successors, Swabia became the most rich, civilized, and powerful country of Germany, and the ducal court was the resort of the minnesingers (q.v.); but the wars of the Guelphs and Ghibellines, and the quarrel with the French respecting Naples, put an end to the dynasty in 1268. The ducal vassals in Swabia rendered themselves almost independent, and professed to acknowledge no lord but the emperor. During these dissensions arose the lordships of Württemberg and Baden, with numerous lesser states, holding direct of the crown, and opposed to them the cities, which strove also for an equal independence, and at last, in reward of important service, obtained in 1347 great additional privileges. A number of them united to make common cause against the neighboring feudal lords in 1376 (known as the *First Swabian League*); an opposite league was formed between Württemberg, Baden, and 17 towns, in 1405, called the league of Marbach; and both took part in the war of Swiss independence, the former in support of the Swiss, the latter of the Austrians. At last the towns, which had been rapidly increasing in wealth and power, decided at Ulm, in 1449, to form a standing army and a permanent military commission for the forcible preservation, if necessary, of peace and order; and the count of Württemberg, the most powerful of the opposite party, having joined them, was appointed military chief of the league, which ultimately grew up into the *Great Swabian League*, and exercised both administrative and judicial authority over the whole country, effectively repressing feudal quarrels. In 1512 Swabia became one of the ten circles into which Germany was now divided, received its complete organization in 1563, and retained it almost without change till the dissolution of the empire in 1806. But during this period the wars of the towns with Württemberg, the peasants' war, of which Swabia was one of the foci, the thirty years' war, and those between France and the empire, destroyed the democratic constitution of the towns, and with it their energy, and then their prosperity disappeared, leaving now no relic which could suggest their former great political importance.

SWAIN, a co. in w. North Carolina, adjoining Tennessee; drained by the Little Tennessee river; bounded on the n. by the Great Smoky mountains; about 500 sq. m.; pop. '80, 3,785—549 colored. The surface is even and well wooded. The soil is only partly fertile. The principal productions are corn, tobacco, and pork. Co. seat, Charleston.

SWAIN, CHARLES, 1803-74; b. Manchester, England; called the "Manchester poet;" for 14 years employed in the dyeing establishment of his uncle, afterward became an engraver. While connected with the mill he began to write for magazines and annuals. He published various poems and sketches, some of which were translated into German and French. *Dryburgh Abbey*, an elegy on sir Walter Scott, was written in 1832; new ed. 1858. An edition of his poems, with a portrait, and an introduction by Charles Card Smith, appeared in 1857. Wordsworth, Southey, and James Montgomery were among his friends. In 1857 he received a civil-list pension of £50 per annum.

SWAINSON, WILLIAM, b. England, 1789; served in the British army 1807-15. He studied natural history; went to South America in 1815, and afterward settled in London. He was at one time attorney-general of Tasmania, whither he had emigrated in 1841. He began the publication of *Zoological Illustrations* in 1820, and *Exotic Conchology* in 1821. Among his many works are *Naturalist's Guide* (1822); a number of natural history volumes in Lardner's *Cabinet Cyclopædia*. He was living in 1879.

SWALE. See YORKSHIRE.

SWALLOW. *Hirundo*, a Linnæan genus of birds of the order *insessores*, and tribe *fissirostres*, now divided into a number of genera, which form the family *hirundinidae*. This family consists of birds which prey on insects, catching them in the air, and have great powers of flight, now soaring to a great height, now skinning near the surface of the ground or of the water, and wheeling with great rapidity. The bill is short and weak, very broad at the base, so that the gape is wide; the wings are very long, pointed, and more or less sickle-shaped when expanded; the legs are short and weak, and in some—the swifts (q.v.)—more so than those of any other birds. The tail is generally forked. The plumage is close and glossy. The species are very numerous, and widely diffused, being found in almost all countries. Such of them as occur in the colder parts of the world are summer birds of passage, migrating to warmer regions when winter approaches and insects disappear. The family is divided into two groups, *swifts*, which have remarkably long and curved wings, very small weak legs, and short toes, the hinder toe generally directed forward, and *swallows*—some of which are also called *martins*—having wings not quite so long nor so much curved, rather stronger legs, and longer toes, three before and one behind. The COMMON SWALLOW, or CHIMNEY SWALLOW (*hirundo rustica*), exhibits a character common to many other species, in the very long and deeply-forked tail, the two lateral feathers of which far exceed the others in length. The plumage is very beautiful, the upper parts and a band across the breast glossy bluish black, the forehead and throat chestnut, the lower parts white, and a patch of white on the inner web of each of the tail-feathers except the two middle ones. The whole length of the bird is about 8½ in., of which the outer tail-feathers make 5 inches. The nest is made of mud or clay, formed into little pellets and stuck together, along with straw and bents, and lined with feathers. It is open and cup-shaped, and is generally placed in a situation where it is sheltered from wind and rain, as a few feet down an unused chimney, under the roof of an open shed, or in any unoccupied building to which access can be obtained. Two broods are produced in a year. The migration of this and other British species of swallow, now recognized by all naturalists as an unquestionable fact, was formerly the subject of much dispute, and swallows were supposed by many to become torpid in winter, although it was difficult to imagine that if so they should not frequently be found in that state. The geographical range of these species extends over great part of Europe, Asia, and Africa.—The WINDOW SWALLOW, or HOUSE-MARTIN (*H. urbica*, or *chelidon urbica*), is another very common British species, glossy black above, white below, and on the rump; the feet covered with short downy white feathers, which is not the case in the chimney swallow; the tail long, but its outer feathers not remarkably so. The nest is built of mud or clay, like that of the chimney swallow, but is hemispherical, with the entrance on the side, and is attached to a rock, or, very frequently, to the wall of a house, under the eaves or in the upper angle of a window, to the annoyance of housekeepers who prefer the cleanness of their windows to the lively twitter of the birds, and the opportunity of watching their process of nest-building and their care of their young. House-martins congregate in great numbers, as chimney swallows also do before their autumnal migration, and disappear all at once. The house-martin is among the birds of Lapland and Iceland. The only other common British species of swallow is the SAND-MARTIN (*H. riparia*), smaller than either of the preceding, the toes naked, the tail moderately forked, the plumage brown on the upper parts and across the breast, the under parts white. It makes its nest on sandy river-banks, the sides of sand-pits, and other such situations, excavating a gallery of 18 in. or 2 ft., sometimes 3 or even 5 ft. in length, and more or less tortuous, in the extremity of which some soft material is placed for the reception of the eggs. This wonderful excavation is accomplished entirely by the bill of the bird. The floor slopes a little upward from the entrance, so that the lodgment of rain is prevented. The sand-martin is more local than the other British swallows; but it is distributed over most parts of Europe, Asia, Africa, and North America.—The PURPLE SWALLOW, or PURPLE MARTIN (*H. purpurea*), is a North American species, which has in a few instances been known to visit the British islands. The general color, both of the upper and under parts, is shining purplish blue; the wings and tail black. It abounds in North America, and is a universal favorite in the northern parts, being hailed as the harbinger of spring, and frequenting even the streets of towns. It is a very general practice to place boxes near houses for the martins to make their nests in, which are very artificial, consisting merely of dried grass, leaves, moss, feathers, and the like. Boxes nailed to trees are also readily occupied by the RUFOUS-BELLIED SWALLOW (*H. erythrogaster*), another North American species. But this species which very nearly resembles the chimney swallow of Britain, makes a nest of mud and fine hay, in the form of the half of an inverted cone, with an extension at the top for one of the parent birds to sit in occasionally. The REPUBLICAN SWALLOW, or CLIFF SWALLOW (*H. fulva*), of North America, makes a nest of mud, in form somewhat like a Florence flask, which it attaches to a rock or to the wall of a house. Hundreds sometimes build their nests in close proximity. The FAIRY MARTIN (*H. ariel*), a small Australian species, also builds a flask-shaped nest, with the mouth below, attaching it to a rock, or to the wall of a house, and numerous nests are often built close together.—Some of the swallows of tropical countries are much smaller than any of the European species.—The East Indian

swallows which make the edible nests (q.v.), belong to the section of the family to which the name swift is given.

SWALLOWING. THE ACT OF, is accomplished by a set of associated movements which have been divided by physiologists into three stages. In the first stage, the food having been previously duly reduced to a pulp by trituration and insalivation, is carried back by the contraction of various muscles until it has passed the anterior palatine arch. See **PALATE**. So far, the movements are purely voluntary. The second stage now commences, during which the entrance of food into the nasal cavities and larynx is most carefully guarded against by certain reflex (involuntary) actions, which have been only clearly recognized since the introduction of the use of the laryngoscope during the last few years. The tongue is carried further backward, the larynx rises so as to be covered by the epiglottis, which is depressed and lies horizontally, so that its upper border touches the posterior wall of the pharynx. Coincident with these movements, the sides of the posterior palatine arch contract by muscular action, and approach each other like a pair of curtains, so as almost to close the passages from the fauces into the posterior nostrils: the closure being completed by the uvula. A sort of inclined plane is thus formed, and the morsel slips downward and backward into the pharynx, which is raised to receive it. Very little, if any, voluntary action is here exerted. The third stage—the propulsion of the food down the œsophagus—then commences, and this process is effected in the upper part by means of the constrictor muscles of the pharynx, and in the lower, by the muscular coat of the œsophagus itself. At the point where the latter enters the stomach, there is a sort of a sphincter muscle which is usually closed, but which opens when sufficient pressure is made on it by accumulated food, closing again when this has passed. See Carpenter's *Principles of Human Physiology*.

SWALLOW-WORT. See **ASCLEPIAS**.

SWAMMERDAM, JAN, a distinguished naturalist, was b. at Amsterdam, Feb. 12, 1637. Swammerdam, almost from his boyhood, showed the greatest eagerness in the study of natural history. Having entered upon the study of medicine, he particularly occupied himself with anatomy, and continued unremittingly to collect insects, to investigate their metamorphoses and habits, and, by the aid of the microscope, to examine their anatomic structure. He took his degree of doctor of physic at Leyden in 1657, and entered upon the practice of his profession, which his bad health, however, soon compelled him to relinquish. He continued to be chiefly engrossed with anatomy and entomology. His treatise on bees appeared in 1673; a treatise on ephemera in 1675. It is impossible, however, for us to enumerate his many publications, all of which were first published in Dutch, and afterward translated into Latin, and many of them into English, French, and German. Swammerdam's discoveries were very numerous, both in human and comparative anatomy. His skill in using the microscope was very great, and his manipulation of the most minute subjects extremely dexterous. He succeeded in giving distinctness to the forms of very minute viscera, by inflating them with air; a method of his own invention. It is melancholy to add, that Swammerdam, who had always displayed strong religious feelings, and expressed them in his writings, was at last carried away by the fanatical extravagances of Antoinette Bourignon (q.v.), began to think all his former pursuits sinful, and relinquished them for a visionary religious life of mere meditation and devotion. His health rapidly declined, and he died at Amsterdam, Feb. 17, 1680. No man of his time contributed more than Swammerdam to the progress of natural history and physiology. He was the inventor of the method of making anatomical preparations by injecting the blood-vessels with wax, and also of the method of making dry preparations of the hollow organs, now generally employed.

SWAN, *Cygnus*, a genus of birds of the duck (q.v.) family (*anatida*), constituting a very distinct section of the family. They have a bill about as long as the head, of equal breadth throughout, higher than wide at the base, with a soft cere, the nostrils placed about the middle; the neck very long, arched, and with 23 vertebra; the front toes fully webbed, the hind toe without membrane; the keel of the breast-bone very large; the intestines very long, and with very long caeca. They feed chiefly on vegetable substances, as the seeds and roots of aquatic plants, but also on fish-spawn, of which they are great destroyers. They are the largest of the *anatida*. They have a hissing note like geese, which they emit when offended, and strike with their wings in attack or defense. The common notion, that a stroke of a swan's wing is sufficient to break a man's leg, is exaggerated. The COMMON SWAN, MUTE SWAN, or TAME SWAN (*C. olor*), is about 5 ft. in entire length, and weighs about 30 lbs. It is known to live for at least 50 years. The male is larger than the female. The adults of both sexes are pure white, with a reddish bill; the young (cygnets) have a dark bluish-gray plumage, and lead-colored bill. The bill is surmounted by a black knob at the base of the upper mandible, and has a black nail at its tip. In its wild state, this species is found in the eastern parts of Europe and in Asia; in a half-domesticated state it has long been a common ornament of ponds, lakes, and rivers in all parts of Europe. It is an extremely beautiful bird when seen swimming, with wings partially elevated, as if to catch the wind, and finely curving neck. The ancients called the swan the bird of Apollo or of Orpheus, and ascribed to it remarkable musical powers, which it was supposed to exercise particularly when its death approached. It has, in reality, a soft low voice, plaintive, and

with little variety, which is to be heard chiefly when it is moving about with its young. The nest of the swan is a large mass of reeds and rushes, near the edge of the water, an islet being generally preferred. From 5 to 7 large eggs are laid, of a dull greenish-white color. The female swan sometimes swims about with the unfledged young on her back; and the young continue with their parents until the next spring. The swan is now seldom used in Britain as an article of food, but in former times it was served up at every great feast, and old books are very particular in directions how to roast it and to prepare proper gravy.—The POLISH SWAN (*C. immutabilis*), of which flocks have occasionally been seen in Britain in winter, differs from the common swan in its orange-colored bill, in the smaller tubercle at its base, and in the shape and position of the nostrils. The young are also white, like the adults. It belongs chiefly to the north-eastern parts of Europe. Many naturalists regard it as the true wild state of the common swan.—The WHISTLING SWAN, ELK SWAN, or HOOPER (*C. ferus*), abounds in the northern parts of Europe and Asia. Flocks frequently visit Britain in severe winters, and their migrations extend as far s. as Barbary. A few breed in the Orkney islands, but the greater number in more northern regions. The size is about equal to that of the common swan, and the color is similar, but the bill is more slender, is destitute of knob, and is black at the tip, and yellow at the base. This bird is frequently brought to the London market. The names hooper and whistling swan are derived from the voice. The anatomical differences between this species and the common swan are more considerable than the external, particularly in the double keel of the breast-bone forming a cavity which receives a long curvature of the wind-pipe.—BEWICK'S SWAN (*C. Bewickii*), another native of northern Europe, is more rare in Britain, but flocks are sometimes seen. It is about one-third smaller than the whistling swan.—The AMERICAN SWAN (*C. Americanus*) nearly resembles Bewick's swan. It breeds in the northern parts of North America, and its winter migrations only extend to North Carolina.—The TRUMPETER SWAN (*C. buccinator*) is another American species, breeding chiefly within the Arctic circle, but of which large flocks may be seen in winter as far s. as Texas. It is rather smaller than the common swan.—The ancients spoke of a black swan proverbially as a thing of which the existence was not to be supposed, but Australia produces a BLACK SWAN (*C. atratus*), rather smaller than the common swan, the plumage deep black, except the primaries of the wings, which are white. The bill is blood-red. It has been introduced into Britain, and breeds freely. It is very abundant in some parts of Australia.—The BLACK-NECKED SWAN (*C. nigricollis*) is a South American species, as is the DUCK-BILLED SWAN (*C. anatotides*), the smallest of all the species, white, with black-tipped primaries, common about the strait of Magellan. It is a curious circumstance that the black color appears more or less in all the species of the southern hemisphere, and in them alone, except in the approach to it made in cygnets.

Swans, according to the law of England, are birds royal. When they are found in a partially wild state, on the sea and navigable rivers, they are presumed to belong to the crown, and this is one of the prerogatives of the crown, though it may be delegated to a subject. The royal birds generally have a mark on them, and the king's swan-herd once was an important person. A subject is not entitled to have a swan-mark unless he has a qualification of land, and has a grant from the crown, or prescriptive use. But any person may have swans in his grounds in a tame state, and then he has a property in them. Whoever steals or destroys swans' eggs, forfeits 5s. for every egg, and whoever steals a marked swan of the crown, or a tame swan, commits felony. In Scotland, there is some trace of the bird having been once treated with royal honors, but latterly they have been in the category of other tame birds.

SWAN, JAMES, 1754-1831; b. Scotland: came to this country when a boy and engaged in business in Boston. He took part in the popular agitation leading to the revolution, was one of the Boston "tea party," and aide to Warren at Bunker Hill. He afterward served as member of the Massachusetts legislature and adjt. gen. of the state. After the war he made a large fortune in Paris, and, 1795-98, visited this country and spent money profusely. In 1815, then being in Europe, he was arrested on a civil suit, and, refusing to settle, lived for 15 years in Ste. Pelagie prison, Paris, in the most magnificent style. He published a number of pamphlets on such subjects as the slave trade (1772), fisheries, the commerce of France and the United States, agriculture, and manufactures.

SWANN, THOMAS, b. Va.; educated at the university of Virginia; afterward studied law at Washington, and in 1834 settled in Baltimore, where the greater part of his life was spent. He was president of the Baltimore and Ohio railroad, 1847-53, and was connected with other railroads. In 1858 he was elected mayor of Baltimore. He warmly supported the union against the rebellion, and in 1864 was chosen governor of the state. In 1868 he was elected to congress and served ten years.

SWAN'S SEA (Welch, *Abertary*), a market t., municipal and parliamentary borough, and sea-port of the county of Glamorgan, South Wales, stands on the right bank and at the mouth of the Tawe, 60 m. w.n.w. of Bristol. The harbor is formed by means of piers of masonry projecting from either side of the mouth of the Tawe into Swansea bay, a wide inlet of the Bristol channel. The vast resources of the coal-field in the midst of which the town is situated began to be explored and turned to commercial

account about the year 1830; and since that time the progress of Swansea has been so rapid that it is now the most important town in South Wales. The houses and public edifices and institutions are of recent erection. A good public hall was erected in 1864, and a spacious and well arranged infirmary in 1867. Smelting and refining copper is the staple trade of the town, and the chief source of its prosperity. The coal obtained in the vicinity is peculiarly adapted for smelting purposes, and great quantities of ore are brought hither to be smelted, not only from the copper-mines of Britain, but from Cuba and the west coast of South America. In the immediate vicinity of the town, there are smelting-works, in which about 185,800 tons of copper, copper ores, silver ores, and zinc ores (equal in value to about £4,000,000) are smelted annually. Of the whole amount of copper manufactured in Great Britain, seven-eighths are smelted at Swansea and in its immediate vicinity. In 1859, a large floating dock, 13 acres in extent, was opened by the side of the harbor. Its north side is lined with warehouses for the shipment of coals which are brought to the wharfs by railway. An excellent system of water-works was completed in 1868 at a cost of upward of £70 000. Patent fuel, composed of a mixture of culm and tar, and compressed into the shape of bricks, is an important article of manufacture and trade. There are extensive potteries, and tin, silver, and china works, breweries, rope-walks, and tanneries. In 1877, 5,075 vessels, of 704,914 tons, entered the port, and 6,857, of 975,079 tons, cleared. There are abundant means of communication landward by canals and railways. Pop. 1851, of municipal and parliamentary limits, 31,461; 1861, 41,606; 1871, of mun. bor., 51,702; of parl. bor., 56,995. Of the old castle of Swansea, the ruined remains are used as a military store. Swansea unites with Aberavon, Kenfigg, Loughor, and Neath in sending a member to the house of commons.

SWARGA is the paradise of the Hindu god, Indra (q.v.). It is the residence of some of the inferior gods and deified mortals, who there rest in the shade of the five wonderful trees—*Mandāra*, *Pārijāta*, *Santāna*, *Kalpaurīksha*, and *Harikandana*, drink *Amarita*, or the beverage of immortality; and enjoy the music of the *Gandharvas*, and the dancing of the heavenly nymphs, the *Apsarasas*.

SWARMING, a peculiar mode of reproduction which has been observed in some of the *concretaea*, *desmidiæ*, etc. The granules which form the green matter in the plant, or in one of its joints, become detached from each other, and move about in the cell with great rapidity. The external membrane swells in one point and finally bursts there, when the granules escape into the surrounding water to become new plants. At first they issue in great numbers, but those which remain fast move about within their cell for a long time before they find the way out. Their motion is supposed to be due to cilia. After escaping, they continue their movements for some time, and most of them finally become grouped together in little masses on some substance before beginning to vegetate.

SWATOW, or CHAU-CHAU, a sea-port t. on the coast of China, in the province of Quang-tung, 212 m. n.e. from Canton. It is one of the ports which were opened to foreign trade by the treaty of Tien-tsin, and has a resident British consul. The trade is rapidly increasing. In 1875-77 the imports were valued at £1,787,090, and the exports at £367,400. Half the total is direct trade with foreign ports. Opium is the chief article of importation, next to which rank cotton and woollen goods, metals and cotton yarn. The chief exports are sugar, rice, tea, and paper. Swatow is pleasantly situated on a sheltered bay.

SWAYNE, JOHN WAGER, b. Columbus, Ohio, 1835; son of judge Noah H.; graduate of Yale college, 1856; studied law and commenced practice in his native town. In the war of the rebellion he was maj. 43d Ohio infantry, 1862; raised to col. after effective service at Iuka and Corinth. He served through the Georgia campaign, lost a leg at Salkahatchie, where he greatly distinguished himself, and was made maj.gen., 1865, and assigned to the commission on refugees, freedmen, and abandoned lands. He was commissioned col. 45th infantry, 1866; retired, 1870.

SWAYNE, NOAH HAYNES, LL.D., b. Va.; admitted to the bar in 1824, and began practice in Ohio. He was a member of the state legislature in 1829, and again in 1836. He was U. S. district-attorney, 1830-39, and was appointed a justice of the U. S. supreme court in 1861.

SWEABORG, or SVE'ABORG, a great Russian fortress in the principality of Finland, and government of Viborg, sometimes called "the Gibraltar of the north," protects the harbor and town of Helsingfors, from which it is only 3 m. distant. The fortifications extend over seven islands, the *Nylandischen Skären*, but the grand central point is the island of Wargöe. The islands are connected with each other by means of bridges, and between two of them lies the single narrow entrance to the harbor, which can hold from 70 to 80 ships of the line. Sweaborg has a civic pop. of about 3,000, the greater part of whom are manual-laborers, ship-carpenters, and traders, and a garrison of some 5,000 men (including women and children). During the Crimean war the Anglo-French fleet in the Baltic made a reconnaissance of the place, and bombarded it for two days (Aug. 9 and 10, 1855), but found the defenses too formidable to be reduced by the means at their disposal.

SWEARING, PROFANE, according to the law of England, is an offense for which the party may be convicted by a justice of the peace according to a scale of penalties. A day laborer, common soldier, sailor, or seaman forfeits 1s per oath; every other person under the degree of a gentleman, 2s; and every person above the degree of a gentleman, 5s—for a second offense double these sums; for a third treble, etc. If the cursing take place in the presence of a justice of the peace, the latter may convict the prisoner then and there, without further process or evidence; and in all cases a constable may apprehend a profane swearer, and carry him before a justice. On a recent occasion a man swore a volley of oaths, twenty times repeating the oath, and the justices fined him 2s for each repetition, making in all £2, and this was held a proper conviction. The justices of the peace in Scotland have a similar jurisdiction intrusted to them, to convict of profane swearing, and fine according to the rank of the party.

SWEAT (A. S. *swat*, Sansc. *svaidas*, Lat. *sudor*; Gr. *hydor*, moisture; Lat. *ud(us)* = wet), or perspiration. The nature, composition, and uses of this fluid in the normal state have been sufficiently noticed in the article **SKIN**. It may be additionally remarked, in connection with the physiology of sweat, that the composition of this fluid varies materially according to the part of the body from which it is secreted. Thus Funk found the sweat of the feet was richer in fixed salts than that of the arm, in the ratio of 5 to 3; and Schotten found a considerable preponderance of potassium in the former. In the negro, Dr. Copland and other observers have found that both the gaseous exhalations from the skin, and the solid matters contained in the sweat, were much greater than in the white races. It has been shown in the article **SKIN** that the sweat-glands, like the lungs and kidneys, act as depurating organs, and separate and carry off effete matters from the blood. This eliminating action of the skin is modified in various diseases; in some cases being diminished, as in the early stage of fevers, in inflammations before suppuration commences, in scurvy, diabetes, sunstroke, etc., while it is more or less increased in the sweating stage of ague, in acute rheumatism, in Asiatic cholera, in certain adynamic fevers, in the advanced stages of pulmonary consumption, in the formation of matter in internal parts, etc. The sweat is naturally acid in health, but in prolonged sweating the secretion becomes neutral, and finally alkaline. Little is known with certainty regarding the coloring matters of sweat. In cases of jaundice, the sweat sometimes communicates a yellow tinge to the body-linen; and instances of blue, red, and bloody sweat are on record. Cases of sweat of these colors are recorded in Simon's *Animal Chemistry* (Syd. Soc. Trans.), (London, 1845), vol. ii., p. 110. Cases of unilateral sweating, stopping abruptly at the middle line, have been occasionally noticed, especially in aneurism of the aorta.—See Gairdner's *Clinical Medicine*, page 557. Dr. Druitt has pointed out the use of hot-water as a remedy for profuse perspiration. He has found it serviceable in (1) oversweating in good health and hot weather; (2) undue sweating in special parts of the body, as the hands, feet, or armpits; (3) true hectic; and (4) ordinary night sweats in phthisis not preceded by hectic symptoms. To be of any service, the water must be applied at as great a heat as the patient can possibly bear (see his paper on this subject in the *Medical Times* for March 4, 1865). For a very interesting and learned discussion on our Saviour's bloody sweat during his passion, the reader may consult Stroud *On the Physical Cause of the Death of Christ*, and Trusen's chapter *Von dem Blutschweisse Christ* in his *Darstellung der Biblischen Krankheiten*, 1843.

SWEATING SICKNESS, *Thré*, is the term given to an extremely fatal epidemical disorder, which ravaged Europe, and especially England, in the 15th and 16th centuries. It derives its name "because it did most stand in sweating from the beginning until the ending," and "because it first began in Englande, it was named in other countries the Englishe sweat."—*The Boke of Jhon Cains against the Sweating Sicknes*. It first appeared in August, 1485, in the army of Henry VII., shortly after his arrival at Milford in South Wales from France, and in a few weeks it spread to the metropolis. It was a violent inflammatory fever, which, after a short rigor, prostrated the powers as with a blow; and amid painful oppression at the stomach, headache, and lethargic stupor, suffused the whole body with a fetid perspiration. All this took place in the course of a few hours, and the crisis was always over within the space of a day and night. The internal heat which the patient suffered was intolerable, yet every refrigerant was certain death. "Scarce one amongst a hundred that sickened did escape with life."—Holinshed, vol. iii. p. 482. Two lord mayors of London and six aldermen died within one week; and the disease for the most part seized as its victims robust and vigorous men. It lasted in London from the 21st (some authorities say the middle) of September to the end of October, during which short period "many thousands" died from it. The physicians could do little or nothing to combat the disease, which at length was swept away from England by (as many supposed) a violent tempest on New Year's day. The disease did not re-appear till the summer of 1506, when it broke out in London, but does not seem to have occasioned any great mortality. In July, 1517, it again broke out in London in a most virulent form; it being so rapid in its course that it carried off those who were attacked in two or three hours. Among the lower classes, the deaths were innumerable, and the ranks of the higher classes were thinned. In many towns a third, or even a half of the inhabitants were swept away. On this occasion, the epidemic lasted about six months. In May, 1528—the year in which the French army before Naples was de-

stroyed by pestilence, and in which the putrid fever known as *Trousse-galant* decimated the youth in France—the sweating sickness again broke out in the metropolis, spread rapidly over the whole kingdom, “and fourteen months later, brought a scene of horror upon all the nations of northern Europe scarcely equaled in any other epidemic.—Hecker’s *Epidemics of the Middle Ages*, (Syd. Soc. Trans.), p. 238 How many lives were lost in this epidemic, which has been called by some historians the *great mortality*, is unknown; but the mere fact that the king (Henry VIII., who, whatever his faults, was never accused of cowardice) left London, and endeavored to avoid the disease by continually traveling, shows the general feeling of alarm that existed. In the following summer (July 25, 1529), having apparently died out in England, it appeared in Germany, first at Hamburg, where it is recorded that 8000 persons died of it, and shortly after at Lubeck, Stettin, Augsburg, Cologne, Strasburg, Hanover, etc. In September, it broke out in the Netherlands, Denmark, Sweden, and Norway, whence it penetrated into Lithuania, Poland, and Livonia. By January of the following year, after an existence of three months, it had entirely disappeared from all these countries. For three-and-twenty years the sweating sickness totally disappeared, when for the last time (April 15, 1551) it burst forth in Shrewsbury. The banks of the Severn seemed to be the focus of the malady, which was carried from place to place by poisonous clouds of mist. There died within a few days 960 of the inhabitants of Shrewsbury, the greater part of them robust men and heads of families. The disease spread rapidly over the whole of England, but seems to have disappeared by the end of September. The deaths were so numerous, that one historian (Stow) states that the disorder caused a *depopulation* of the kingdom. The very remarkable observation was made in this year, that the sweating sickness uniformly spared foreigners in England, and on the other hand, followed the English into foreign countries. The immoderate use of beer among the English was considered by many as the principal reason why the sweating sickness was confined to them. “By the autumn of 1551,” says Hecker, “the sweating sickness had vanished from the earth; it has never since appeared as it did then and at earlier periods; and it is not to be supposed that it will ever again break forth as a great epidemic in the same form, and limited to a four-and-twenty hours’ course; for it is manifest that the mode of living of the people had a great share in its origin, and this will never again be the same as in those days.”—*Epidemics of the Middle Ages* (Syd. Soc. Trans.), p. 306.

SWEDEN, *Sverige*, the eastern portion of the Scandinavian peninsula, constitutes with Norway (q.v.) one joint kingdom. It is situated in 55° 20'—69° 3' n. lat., and 11°—24° e. long., and is bounded on the n. and w. by Norway; on the extreme s.w. and s. by the Cattegat, which separates it from Denmark; on the s.e. and e., as far as 66° n. lat., by the Baltic and the gulf of Bothnia; and from thence to the extreme n. by Russia. The area is nearly 170,000 sq. m.; and the pop. was, in '71, 4,204,177. Its length is 969 m., and its greatest width from 150 to 280 miles. Sweden is divided into three provinces—viz., Norrland, the largest and most northern; Sweden Proper, or *Svea-rike* (land of the Swedes), in the center; and Göthland or *Göta-rike* (land of the Goths), to the south. The following are the areas and populations of the 25 län into which the provinces are subdivided (in '78 the total pop. was estimated at 4,485,000):

Län.	Area in Geog. Sq. Miles.	Population in Dec. 1871.
Stockholm.....	135.5	131,731
Upsala.....	94.9	101,731
Södermannland.....	122.4	126,977
Oestergötland.....	194.9	257,267
Jönköping.....	202.2	180,560
Kronoberg.....	180.7	159,253
Kalmar.....	209.1	234,597
Götland.....	57.	54,237
Flekinge.....	54.7	126,935
Kristianstad.....	117.9	233,492
Malmöhus.....	86.8	318,786
Halland.....	89.3	127,842
Östergötland and Bohus.....	91.8	233,680
Älfsborg.....	232.7	286,454
Skaraborg.....	155.6	234,601
Vernland.....	306.6	261,716
Orebro.....	164.7	169,319
Vestmannland.....	119.9	115,605
Kopparberg.....	528.7	176,946
Gästeborg.....	351.	150,374
Vesternorrland.....	447.5	136,939
Jämtland.....	921.2	71,338
Vesterbotten.....	1122.5	93,154
Norbotten.....	1931.8	77,328
	8078.8	4,065,605
City of Stockholm.....		138,512
Total population.....		4,204,177

In 1878 Sweden ceded her only colony, St. Bartholomew (q.v.), to France (to which country it once belonged) on payment of the purchase money agreed on.

Unlike Norway, Sweden possesses few high mountains, but contains numerous lakes of large dimensions. The coast skirting the Baltic, and the adjoining islands, are for the most part low and sandy, although in some parts, as in the vicinity of the outlet of lake Maelar into the sea (in about 58° n. lat.), the shores are steep; and on the s. and w. coast, the generally low, alluvial lands are replaced by more rocky formations.

In the northern parts the land rises gradually from the gulf of Bothnia to the Kjölen range, belonging to the great Norwegian Fjeldmark, which constitutes the true watershed and natural boundary between Sweden and Norway. South of 62° n. lat., the slope is directed southward, attaining its lowest level in the vicinity of the three great lakes of Vener, Maelar, and Hjelm, which, together with the great Vetter lake, nearly intersect the country from e. to w.; and s. of these great inland waters, the surface is in general level, though ranges of high ground and detached hills occur.

Sweden may be considered to be divided into three distinct parts—viz., the northern or alpine region, the central or lake district, and the southern or mining district. The extreme s. includes the only level and fertile tract, in which wheat can at all times be advantageously and extensively cultivated. The lakes of Sweden have been computed to cover nearly $\frac{1}{4}$ th of the entire area of the country. The largest are lake Vener (q.v.); lake Vetter (q.v.); and the Maelar lake (q.v.). The rivers are generally short and rapid, and only made navigable by art. The largest is the Ängermann Elv, which flows into the gulf of Bothnia. The Cättegat is connected with the Baltic by means of an admirable system of canals, etc.

Temperature, Natural Products, etc.—The differences of climate in Sweden are necessarily very great, considering that its most northern parts are more than 2° within the polar circle, and its southern extremity 11° s. of it, besides which many districts are so nearly surrounded by seas and lakes as to have the conditions of an insular position. Great extremes of temperature are common in different parts of Sweden; thus, while Stockholm has a mean annual temperature of $42^{\circ}.2$ Fahr., and Göteborg $46^{\circ}.3$, the summer temperature of the former is $60^{\circ}.4$ Fahr., and that of the latter $62^{\circ}.13$; and the winter temperature of the former only $25^{\circ}.8$, and that of the latter $31^{\circ}.5$ Fahr.

The heat of the summer, which is scarcely separated from the cold of the winter by either spring or autumn in the extreme northern districts, enables the inhabitants to cultivate barley, which is reaped within two months of the time of its sowing, although even the hardier cereals, as oats and rye, will not ripen above the parallel of 66° n. lat. Indeed, the climate of Sweden generally is unfavorable to the growth of grain, the annual yield of which frequently falls short of the wants of the population. The principal articles of cultivation are, in addition to the various cereals, potatoes, hemp, flax, tobacco, and hops, which are generally grown in sufficient quantities for home consumption. The forests are of great extent, covering nearly one-fourth of the entire surface, and rising at some spots to an elevation of 3,000 ft. above the level of the sea. The birch, fir, pine, and beech are of great importance, not only for the timber, tar, and pitch, which they yield, but also from their supplying charcoal and firewood. Above the parallel of 64° , stunted bushes, berries, dwarf-plants, and lichens are the only forms of vegetation to be met with. The common fruit-trees, as cherries, apples, and pears, grow as far north as 60° , but the fruit seldom comes to great perfection except in the southern provinces; cranberries and other berries abound, however, in all parts of the country. Bears and beavers, which were formerly often met with, are becoming scarce; but wolves, lynxes, foxes, martens, squirrels, eagles, reindeer in the Lappmarks, etc., are still common; while the elk and deer are found in some of the forests, which abound in hares, woodcock, blackcock, and various other kinds of small game; and lemmings (q.v.) occasionally descend from the mountains in large numbers, and lay waste the low country. The lakes yield a great abundance of fish, 88 different kinds of sea and freshwater fish being brought to market. In 1870, there were in Sweden 428,446 horses, 1,965,800 horned cattle, 1,780,000 sheep and goats, and 354,303 swine.

The mineral products of Sweden, which are extremely rich, include some gold and silver (which, however, do not pay the cost of working), copper in abundance, iron of the finest quality, alum, vitriol, marble, sulphur, lead, plumbago, cobalt, nickel, zinc, and some coal of very inferior quality.

Next to agriculture, mining constitutes the most important branch of national industry, and in some provinces is the principal employment. The Danemora mines, in Upsal Län, yield a metal which is capable of being converted into the finest steel, and which is for the most part purchased for the English market. At Gellivare in south Lapland enormous quantities of iron ore of superior quality have recently been extracted from mines, which promise to rival those in Upsala.

Ship-building forms an extensive branch of local industry. The merchant-sailing marine numbered in 1874, 4,338 vessels with a tonnage of about 450,000; the number of vessels that cleared the Swedish ports in 1876, was 16,775, with a tonnage of about 2,533,500, of which one-third belonged to Sweden.

Exports and Imports.—The chief articles of export are iron and timber, copper, cobalt, alum, hemp, oil, birch-bark, hides, furs, paper, tobacco, home-spun linens, pitch

and tar, etc. The Baltic lands, Great Britain, France, Portugal, and the Brazils take the greater part of these articles. The imports include yarn, wool, cotton, leather, coals, salt, machines, manure, textile fabrics, wines, and the ordinary colonial produce. The value of the imports in 1874 was 306,810,000 rixdalers, or about £18,111,670; that of exports, 243,332,000 rixdalers, or about £12,962,914.

In 1858 the decimal was introduced into Sweden, when the standard foot, which was retained, was divided into 10 in. of 10 lines, and the old standard pound made the basis of the hundredweight of 100 pounds. The rixdaler rixmynt = 100 oere, or about 1s. 2d., now usually called *krona*, has been made to supersede the old rixdaler-banco of 150 oere.

Revenue, etc.—The revenue is derived from direct and indirect taxation, state property, railways, customs, etc. The budget for 1877 gave the annual receipts at 78,258,000 rixdalers, or about £4,347,670, and the expenditure at the same figure; of which about 10,000,000 rixdalers were for extraordinary expenses. The frequent surplus of expenditure, which is almost invariably due to the prosecution of national and public works, is formally sanctioned by the diet, which annually provides means for covering the deficit by the appropriation of certain state funds for the purpose, and by the levying of a general income-tax. At the end of 1877 the national debt of Sweden was 182,157,81 rixdalers or crowns, nearly four-fifths of which are held by foreigners.

Army, Navy, etc.—The Swedish army, which is nominally rated at about 150,000 men, has a special and peculiar organization, as it consists, in addition to the värfvare or enlisted troops, of the "indelta," or cantoned militiamen, who are maintained at the cost, and on the property, of the landed proprietors: each estate being mulcted according to its value or extent to maintain one or more men, and provide them with "torps" or cottages, a certain portion of land, and a fixed rate of payment. In return these reserve soldiers, who are for the most part married men, serve the proprietor as field-laborers in times of peace, except during the four weeks of each year in which they are called out for drill. In case of war they can be sent with the companies in which they are enrolled into active service, and they are then paid by the crown. The rest of the army is made up of volunteers, who serve for six years, every Swede between the age of 20 and 25 years being, moreover, bound to serve in the *beväring* or national guard. In addition to these corps, companies of volunteer free-shooters were created in 1861 for the general defense of the country, and placed under the command of officers appointed by the crown. The fleet consisted in 1878 of 150 vessels (of which 52 were steamers), carrying in all about 400 guns. There are on an average 7,800 men engaged in active service; while in time of war, a coasting merchant fleet of 3,200 vessels can be called into requisition, together with a reserve of 25,000 men. The principal fortresses are Karlssten, Karlskrona, and Vaxholm near Stockholm. The military and other orders are the Seraphim, the Sword, the Northern Star, and the Order of Vasa. The order of Charles XIII. embraces the highest rank of freemasons in Sweden.

Form of Government.—Sweden is a hereditary and constitutional monarchy, based on the fundamental law of 1809, by which it was decreed that the succession should be in the male line; that the sovereign should profess the Lutheran faith; and have sworn fidelity to the laws. The diet, which meets every year, and remains sitting for three or four months, is composed of two chambers, which are both elected by the people. The first chamber consists of 127 members, who receive no payment, and are elected for nine years, their number being, however, dependent upon the amount of the population. They must be possessed of an income of about £225, and have attained the age of 35. The second chamber is composed of 194 members, elected for three years, on a lower scale of qualification as to property and age; and receiving payment for their attendance during each session of the diet, and for their traveling expenses. Election to both chambers is by ballot. The diet exercises a strict control over the expenditure of the revenue, fixes the budget, and has power to take cognizance of the acts of the ministers and crown officers. The king's person is inviolable, and he can exercise a veto on the decrees of the diet. He is the supreme head of the law courts, nominates to all appointments, can declare war, make peace, and conclude foreign treaties. He is assisted by a council of state composed of 10 members, who are responsible to the diet.

Law, etc.—The administration of the law is independent of the state, and presided over by the chancellor of justice, *justitie kanslar*, appointed by the king, and an attorney-general, *justitie ombudsmann*, appointed by the diet. There were 587,581 cases brought before the courts in 1875, the large proportion of which were merely for slight offenses against the law. The expenses incurred annually for the support of the poor are about 6,000,000 rixdalers, which is nearly covered by the regular income obtained by the rates imposed for the purpose.

Sweden is divided administratively into 25 *läns*, presided over by *länsmen* or chief magistrates, and subdivided into 117 *fögderin*, and 517 *länsmans* districts. There are 90 chief towns (*städer*), only a limited number of which have the right of trading with foreign ports, and 19 market-towns (*Köpingar*). Besides Stockholm, the capital (q.v.), only one town, Göteborg (71,000 in 1877), has a pop. of more than 50,000. Next in rank come Malmö, with 34,439; Norköping, with 27,226; Gelle, with 18,137; and Karlskrona,

with 17,787 inhabitants. Upsala, a cathedral and university town, which is the most interesting spot in the kingdom, as the original seat both of Christianity and of the ancient Odinic faith, has a pop. of only 13,446.

Religion, etc.—The predominant form of religion in Sweden is the Lutheran; the official tables of the census for 1870 showing only 6,440 persons who belonged to other forms of faith, of whom 1918 were Baptists, and 1836 Jews. The affairs of the church are administered by 1 archbishop (of Upsala) and 11 bishops, whose collective dioceses include about 2,500 parishes, with about 3,500 pastors.

Education, etc.—Education is universally diffused among the Swedes by the agency of *fasta* (regular) and *flyttanda* (ambulatory) schools in all the country districts. There were, in 1869, 2,303 of the former and 1206 of the latter kind, together with 3,410 infant schools, which were attended in all by 679,128 children, and instructed by 5,030 male and 2,115 female teachers. Public instruction is compulsory for all children, and the cost is defrayed by the nation. Ample means are supplied for a higher form of instruction in the *läroverk* or gymnasia of the towns, and at the universities of Upsala and Lund. The Karolinska institute at Stockholm is the medical college of Sweden; and there are numerous technical, military, and other special collegiate institutions in the principal towns of the kingdom. The transactions of the two learned societies, the "*Svenska Vetenskaps Selskap*," and the "*Svenska akademie*," afford honorable testimony to the advanced condition of scientific inquiry in Sweden. The royal library of Stockholm and those of Upsala and Lund number about 100,000 vols. each. That of Upsala is contained in a special building, *Carolina Rediviva*, to which is attached a botanical garden arranged on the Linnæan system.

Roads, Railways, etc.—There were, in 1878, 12,000 English miles of high-roads in Sweden, and nearly double that length of way in parish and by-roads. In 1877 a length of 3,010 English miles of railway had been opened. In the year 1871 the number of passengers conveyed was 1,659,204, and the receipts from this branch of the traffic were 2,896,184 rixdalers; while the whole of the returns were 7,784,860 rixdalers (£432,490). In 1875 the telegraphic lines measured 4,991 English miles, and, besides the 170 government telegraph stations, there were 351 stations in connection with railways and belonging to companies; 1,009,539 messages were transmitted, of which number 645,913 were from and for Sweden; and the receipts were for the same year 1,953,109 rixdalers. There passed 16,250,000 letters through the post-offices of Sweden in 1875, when the receipts were 3,650,000, and the expenses of the department 3,700,000 rixdalers.

History.—The legendary history of Sweden forms part of Scandinavian history. When we first hear of Sweden the country was inhabited by numerous tribes, kindred in origin but politically separate. Two principal groups, however, are recognizable—*Goths* in the south and *Sveedes* in the north. These possessed in common a national sanctuary, the temple of Uppsala, which laid the basis of a later unification, for gradually the royal chieftains of Uppsala extirpated the inferior princes, the *Härad*s and the *Fylkis*. Ingiald Hrada, the last ruler of the old royal family of the *Ynglingar*, who drew their origin from *Njord*, sought to establish a single government in Sweden, and perished in the attempt. To the *Ynglingar* followed in Upland the dynasty of the *Skjoldungar*, which claimed to be descended from *Skjold*, son of *Odin*. *Erik Edmundson*, who belonged to this dynasty, is said to have acquired the sovereignty of the whole of Sweden about the end of the 9th century. The dawn of Swedish history (properly so called) now begins, and we find the Swedes constantly at war with their neighbors of Norway and Denmark, and busily engaged in piratical enterprises against the eastern shores of the Baltic. See *NORMANS* and *RUSSIA*. Efforts to introduce Christianity (see *ANSGAR*) were made as early as 829 A.D., but it was not till 1000 A.D. that *Olof Skötkonung*, the Lap-king, was baptized, nor did the struggle between heathenism and the new religion cease till the burning of the temple of Upsala in the reign of *Inge* (1080–1112). In 1155 *Erik*, surnamed the saint, gave a powerful impetus to the diffusion of Christian doctrines by building churches and founding monasteries. He undertook a crusade against the pagan Finns, and, having compelled them to submit to baptism, and established Swedish settlements among them, he laid the foundation of the union of Finland with Sweden. *Erik's* defeat and murder in 1160 by the Danish prince *Magnus Henriksen*, who made an unprovoked attack upon the Swedish king, was the beginning of a long series of troubles, and during the following 200 years, one short and stormy reign was brought to a violent end by murder or civil war only to be succeeded by another equally short and disturbed. At length, in 1389, the throne was offered by the Swedish nobles to *Margaret*, queen of Denmark and Norway, who, having gladly availed herself of the opportunity thus opened to her of uniting the three Scandinavian crowns into one, threw an army into Sweden, defeated the Swedish king *Albert* of Mecklenburg, who on the deposition of his maternal uncle *Magnus* had been called to the vacant throne, and by the union of *Calmar* in 1397 brought Sweden under one joint scepter with Denmark and Norway. In 1523 Sweden emancipated itself from the union with Denmark, which during the reigns of *Hans* and his son *Kristian II.* (see *DENMARK*) had become hateful to the Swedes, and rewarded its deliverer, young *Gustaf Vasa* (see *GUSTAVUS I.*), by electing him king and declaring its independence of Denmark. *Gustaf Vasa* found an empty treasury, a kingdom exhausted by war, a haughty nobility and clergy (who arrogated the right of electing the sovereign, and who claimed exemption from all

imposts), and a people overburdened with taxation and bad government and divided in regard to religion. On his death in 1560 he left to his successor a hereditary and well-organized kingdom (in which the power of the nobles had been circumscribed, and that of the clergy broken, by the abrogation of Catholicism and the firm establishment of the reformed church under the jurisdiction of the state), a full exchequer, a standing army, and a well-appointed navy. Trade, manufactures, art, learning, and science owed their advancement in Sweden to this patriotic king.

The colossal labors of the great Vasa in raising a semi-barbarous state to an honorable place among the civilized monarchies of Europe, were rendered almost useless by the crimes and misfortunes of his son and successor, Erik XIV., whose high intellectual powers were clouded by a wayward and revengeful nature, leading him finally to insanity. His cruelties and excesses led to his deposition in 1568, when his younger brother Johan ascended the throne, which he occupied for nearly a quarter of a century, dying in 1592, after a stormy reign, stained by the cruel murder of his unfortunate brother Erik, and distracted by the internal dissensions arising from his attempts to force Catholicism on the people, and to carry on war with the Danes, Poles, and Russians. Johan's son and successor, Sigismund, who had been elected king of Poland through the influence of the relatives of his Polish mother, after a short and stormy reign of eight years, which were spent in attempting to restore Catholicism in Sweden, was compelled by the diet to resign the throne in 1599 to his uncle Karl, the only one of Gustaf Vasa's sons who inherited any share of his legislative and administrative talents. The policy of Karl IX., was to encourage the burgher classes at the expense of the nobility; and by his successful efforts to foster trade—in furtherance of which he laid the foundation of Göteborg and other trading ports—develop the mineral resources of the country, and reorganize the system of Swedish jurisprudence, he did much to retrieve the calamitous errors of his predecessors. The deposition of Sigismund gave rise to the Swedo-Polish war of succession, which continued from 1604 to 1660; and on the death of Karl in 1611, his son and successor, the great Gustavus Adolphus, found himself involved in hostilities with Russia, Poland, and Denmark. By the ability of his minister, Oxenstierna, the young king was soon enabled to conclude treaties of peace with his northern neighbors, and to place the internal affairs of his kingdom in order (see GUSTAVUS II.); and although he justly ranks as one of the greatest military commanders of his age, the extraordinary number of benefits which he conferred on every department of the administrative system of Sweden, entitle him to still greater renown as the benefactor of his native country. His death in 1632, on the field of Lützen, would have proved an irreparable calamity to Sweden, had not the able administration of Oxenstierna, during the minority of Gustavus's daughter, Christina, maintained the renown of the Swedish arms abroad, and the political reputation of the country among the other states. The reign of Christina (q.v.) was disastrous in every act but that of her abdication. The short reign of Karl X. was occupied in generally unsuccessful wars against Poland and Denmark; while the minority and long rule of his son, Karl XI.—from 1660 to 1697—was characterized by success abroad, and in the augmentation of the regal power, which was declared by an act of the diet to be absolute. His son Karl, known to us as Charles XII. (q.v.), succeeded, at the age of 15, to the power and dominions which his father's abilities had consolidated, but which, notwithstanding his own brilliant genius, he so deeply imperiled by his insatiable ambition, that at his untimely death in 1718, at the siege of Frederikshald, after a brilliant career of glorious but checkered military achievements, he left his country overwhelmed with debts, and disorganized by prolonged misrule. With him the male line of the Vasas expired, and his sister and her husband, Frederick of Hesse-Cassel, were called to the throne by election, but were the mere puppets of the nobles, whose rivalries and party dissensions plunged the country into calamitous wars and almost equally disastrous treaties of peace, and, under the leadership of the two great factions of the "Hats," or French party, and the "Caps," or Russian party, demoralized all ranks of society. The weak Adolphus Frederick of Holstein-Gottorp, who was called to the throne on the death of Frederick in 1751, and died in 1771, did little to retrieve the evil fortunes of the state; but his son, Gustavus III. (q.v.) (1771-92), skillfully turned to account the general dissatisfaction of the people with the nobles, to destroy the factions of the Hats and Caps, and to recover the lost power of the crown. His extravagance, dissoluteness, and insincerity detracted, however, from his merits as a ruler, and raised up numerous enemies against him, through whose agency he was assassinated in 1792. His son and successor, Gustavus IV. (q.v.) lacked the ability to cope with the difficulties of the times, and after suffering in turn for his alliance with France, England, and Russia, was forcibly deposed in 1809, and obliged to renounce for himself and his direct heirs the crown in favor of his uncle, Charles XIII., who saw himself compelled at once to conclude a humiliating peace with Russia by the cession of nearly a fourth part of the Swedish territories, with $1\frac{1}{2}$ million of inhabitants. The early part of the reign of Charles, who was childless, was troubled by domestic and foreign intrigues to regulate the choice of an heir to the throne; and when, under the erroneous idea of conciliating Napoleon, the dominant party in Sweden elected General Bernadotte to the rank of crown prince, the latter assumed the reins of government, and by his steady support of the allies against the French emperor, secured to Sweden at the congress of Vienna, the possession of Norway, when that country was separated from Den-

mark. Under the able administration of Bernadotte, who, in 1818, succeeded to the throne as Charles XIV., the united kingdoms of Sweden and Norway made great advances in material prosperity and political and intellectual progress; and although the nation at large entertained very little personal regard for their alien sovereign, his son and successor, Oscar (1844-59), and his grandsons, the late king, Charles XV., and the present king, Oscar II., who came to the throne in 1872, have so identified themselves with their subjects that the Bernadotte dynasty has secured the loyal affections of every section of the united nations of Sweden and Norway.

SWEDENBORG, EMANUEL, was b. in Stockholm, Jan. 29, 1688, and died in London, Mar. 29, 1772. His father was Jesper Svedberg, subsequently bishop of Skara. Swedenborg's lifetime divides itself into two distinct periods; the first, ending with his 55th year, was given to business, science, and philosophy; the second, of nearly 30 years, was consecrated to theology and spiritualism. Swedenborg was educated at Upsal, and traveled for four years in England, Holland, France, and Germany. On his return to Sweden, he was appointed by Charles XII. to an assessorship of mines; and rendered some service to that monarch as military engineer. The Swedenborg family was ennobled in 1719, and the name changed from Svedberg to Swedenborg. Swedenborg is sometimes styled count and baron, but erroneously; he was neither, though he had a seat in the Swedish house of nobles. His mind at this time was busy with mechanical and economical projects. He published short treatises on algebra, giving the first account in Sweden of the differential and integral calculus; on a mode of finding the longitude at sea by the moon; on decimal money and measures; on the motion and position of the earth and planets; on the depth of the sea, and greater force of the tides in the ancient world; on docks, sluices, and salt-works; and on chemistry as atomic geometry. In 1724 he was offered the professorship of mathematics at Upsal, which he declined from a dislike of speculative science. Abandoning his desultory studies, he remained silent for eleven years, and devoted himself to the duties of his assessorship and to a systematic description of mining and smelting, and the construction of a theory of the origin of creation. The result appeared at Leipsic in 1734, in three massive folios, beautifully illustrated, entitled *Opera Philosophica et Mineralia*. The second and third volumes describe the manufacture of copper, iron, and brass, and contain an exhaustive record of the best methods in use in last century. The first volume, entitled *Principia, or the First Principles of Natural Things, being new Attempts toward a Philosophical Explanation of the Elementary World*, is an elaborate deduction of matter from "points of pure motion produced immediately from the infinite." This was followed in 1734 by a treatise on *The Infinite, and the Final Cause of Creation; and the Intercourse between the Soul and the Body*, carrying the doctrine of the *Principia* into higher regions, and resolving the soul into points of motion, and one in substance with the sun. Dissatisfied with his conclusions, he determined to track the soul to its inmost recesses in the body. His studies in human anatomy and physiology with this end in view, appeared as *Oeconomia Regni Animalis*, in two volumes, 1741, and as *Regnum Animale*, in three volumes unfinished, 1744-45. At this point, his course was arrested, and he entered on his career as seer, by which he is known to fame. The particulars of the transition lay in obscurity until 1858, when G. E. Klemming, royal librarian, Stockholm, discovered Swedenborg's diary, kept in 1744. It contains the record of a variety of dreams, visions, and strange communings. After that date, he professed to enjoy free access to heaven and hell. He resigned his assessorship in 1747, that he might devote himself to his office of seer. In 1749 he made his first public appearance in his new character in the issue in London of the *Arcana Cælestia*, completed in 1756 in eight quartos. His life henceforward was spent between Stockholm, London, and Amsterdam, in writing and printing a variety of works in exposition of his experience and doctrines. There is little in any of these which is not comprised in the *Arcana Cælestia*, and a few notes on its contents may serve as a description of the whole. With many digressions, the *Arcana Cælestia* is a revelation of the inner sense of Genesis and Exodus. The early chapters of Genesis are a fragment of an older word, preserved at this day in Tartary, and are not historical in a manner-of-fact sense. Adam signifies the most ancient church, and the flood its dissolution; Noah, the ancient church, which falling into idolatry, was superseded by the Jewish. The spiritual sense pervades the Scriptures, with the exception of Ruth, Chronicles, Ezra, Nehemiah, Esther, Job, Proverbs, Ecclesiastes, the Song of Solomon, the Acts of the Apostles, and the Epistles. No fault is found with these books, but inasmuch as they do not possess the internal sense, they are not the word. The Scriptures are read in heaven in the spiritual sense, but as that sense treats exclusively of God and the human mind, it is void of every reference to earthly scenes, persons, and events. By reason of its symbolism of the inward sense, the letter of Scripture is holy in every jot and tittle, and has been preserved in immaculate perfection since the hour of its divine dictation. The Jewish dispensation having reached its period, God appeared in Jesus Christ. He assumed human nature in its basest condition in the Virgin, wrought it into conformity with himself, "glorified and made it divine." The influence from the redeemed humanity is the Holy Spirit. In a sense the reverse of Socinian, Swedenborg was a Unitarian. He saw God in the Savior, and regarded him as the sole object of worship. The church initiated by the divine advent came to an end in last century, and Swedenborg witnessed the last judg-

ment effected in the year 1757 in the world of spirits. Then commenced a new dispensation, signified by the New Jerusalem in the Revelation, of which Swedenborg was the precursor, and his writings the doctrine. To the objection, that the doctrine is strange and novel, he replied, that mankind were not prepared for its reception, and that the early Christians were too simple to understand it.

One of the chief ends of his mission was the revival of the lost science of correspondences—the science of sciences in the most ancient times. The law of correspondence is universal; the natural world is the outbirth of the spiritual world, and the spiritual world of the invisible mental world. Unseen evil is manifested in things hurtful and ugly; unseen good, in things useful and beautiful. Man is a summary of nature; nature is man in diffusion; all things, therefore, in nature, in fire, air, earth, and water—every beast, bird, fish, insect, and reptile—every tree, herb, fruit, and flower, represent and express unseen things in the mind of man. The Scriptures are written according to correspondences, and by aid of the science their mysteries are unlocked. By it, too, the constitution of heaven and hell is revealed. There are three heavens, consisting of three orders of angels; the first distinguished for love, the second for wisdom, and the last for obedience. All angels have lived on earth; none were created such. They are men and women in every respect; they marry, and live in societies in cities and countries just as in the world, but in happiness and glory ineffable. All in whom love to God and man is the ruling principle, go to heaven at death. Between heaven and hell, a perfect equilibrium is maintained. As there are three heavens, there are three hells, and every angelic society has an infernal opposite. Hell, as a whole, is called the devil and Satan; there is no individual bearing that name. All in whom self-love is the ruling motive, go to hell. There is no resurrection of the earthly body. Every one passes to his final lot at death, some making a short sojourn in an intermediate state, designated the world of spirits, where the good are cured of their superficial infirmities and intellectual mistakes, and where the evil are stripped of all their pretenses to good.

Swedenborg professed to enjoy a numerous acquaintance with departed celebrities, and some of his verdicts on character are appalling; for example, he describes king David and St. Paul as among the lost, while Louis XIV. and George II. are distinguished angels. Nor did he confine his intercourse to ghosts from earth, but extended it to souls from the moon and planets, with the unfortunate exceptions of Uranus, Neptune, and the Asteroids. For these visions, enjoyed while sitting in his chamber, he had this explanation: although in the spiritual world there are *appearances* of space, there is nothing of the objective reality which here divides London from Melbourne. If one spirit desires to see another, the desire instantly brings them together. A good man is, as to his mind, in heaven, and an evil man in hell; and supposing the spiritual sight of either was opened—that is, if the eyes of the spiritual body, which transfuse and animate the material ones, were disengaged from their fleshy vesture—he would see his spiritual companions and the country where he would abide after death.

The grand and distinctive principle of Swedenborgian theology, next to the doctrine of the divine humanity, is the doctrine of life. God alone lives. Creation is dead—man is dead; and their apparent life is the divine presence. God is everywhere the same. It fallaciously appears as if he were different in one man and in another. The difference is in the recipients; by one he is not received in the same degree as another. A man more adequately manifests God than a tree; that is the only distinction. The life of devils is God's presence perverted in disorderly forms. "All things, and each of them to the very uttermost, exist and subsist instantly from God. If the connection of anything with him were broken for a moment, it would instantly vanish; for existence is perpetual subsistence, and preservation perpetual creation." By this law of life is explained man's self-consciousness, freedom, and personality. All these sensations are communicated from God to man. He dwells in man so cordially that he gives him to feel that he lives of himself, even as he lives.

Swedenborg made no attempt to establish a sect. When he proclaimed the Christian church at an end his expectation was, that a new church would be raised up among the Gentiles; but toward the close of his life he was silent as to that hope, and spent his energies in attacking Protestant theology, as if bent on the conversion of northern Europe. All his works were written in Latin, and received little attention from his contemporaries. Apart from his visions, there was nothing peculiar about Swedenborg. He was shrewd in worldly affairs, affable in society, and discussed politics and finance in the Swedish diet like a man of the world. He was never married. In diet he was a vegetarian.

Swedenborgians, or, as they designate themselves, "The New Church signified by the New Jerusalem in the Revelation," were first organized as a separate body in 1783 by Robert Hindmarsh, a printer in Clerkenwell, London, who was elected by lot to baptize and to ordain his comrades in the ministry. The Swedenborgians accept Swedenborg's voluminous theological writings as nothing less than revelations from heaven. The body has not had a prosperous existence. The number of its registered members in Britain is little over 4,000, divided into 58 congregations. These are chiefly in the large towns and in Lancashire; four are in Scotland, but none in Ireland. At one time there were reputed to be a number of receivers of the doctrines of Swedenborg among the clergy of the church of England. The translator of the *Arcana Cœlestia* was the

rev. John Clowes, rector of St. John's, Manchester, for sixty-two years. He died in 1831, and in the pulpit and numerous publications made no secret of his faith. In the United States the Swedenborgians have nearly 100 societies, and about 5,000 members. They chiefly exist in the northern states; and their largest congregation is in Boston. In France, Germany, Sweden, and Russia, there are Swedenborgians, but few and scattered. There is a Swedenborg society, established in 1810, for printing and publishing Swedenborg's works, with a house in London, and an income of about £200 a year. See the life of Swedenborg by White (London, 1867), and various *Documents*, published by prof. Tafel (ed. 1875).

SWEDENBORGIANS organized their first congregation in the United States at Baltimore, 1792; and their general convention in 1817, incorporated under the law of Illinois, and having associations, societies, or members, in nearly all the states. It holds annual sessions in different cities, has a publishing house in New York, a theological school at Waltham, Mass., a Sunday-school union and church music society. Much freedom in regard to ecclesiastical forms is allowed, the power to adopt them being lodged in the whole body of members. The form generally preferred in this country is a modified episcopacy; each state association having its overseer, whose office is permanent. In most of the congregations the worship is partly liturgical, and several books of prayer have been issued; yet as each congregation is free to adopt its own mode, in some only extemporaneous prayers are offered. There is a congregational union, composed of ministers and churches preferring that order, having its headquarters in Philadelphia, with its own board of publication. There are also independent societies and churches not associated together. And, while the number of those who, in an open profession of Swedenborgian doctrines, have separated from other Christian churches is not large, they believe that in all other denominations many persons have adopted more or less of Swedenborg's views. And it is their avowed and cherished purpose to enlarge this number everywhere. A large sum of money has been devoted to publishing some of the most popular of Swedenborg's books for gratuitous distribution to all who apply for them; and in a report, made 1878, it is stated that 36,000 vols. had thus been sent to ministers and theological students of all denominations, and of the white, black, and Indian races. At the general convention of 1877, 64 societies were represented, having about 4,800 members.

SWEDISH LANGUAGE AND LITERATURE. See SCANDINAVIAN LANGUAGE AND LITERATURE.

SWEDISH MOVEMENT CURE. See MOVEMENT CURE.

SWEEPS, on shipboard, are oars of great length used in large vessels during a calm, to enable the ship to obtain steerage-way.

SWEETEREAD, the pancreas (q.v.) of an animal, used as food; it is highly esteemed as being both delicate and nutritious.

SWEET-BRIER. See ROSE.

SWEET FLAG. See ACORUS.

SWEET GUM. See LIQUIDAMBAR.

SWEETMEAT, a general term applied to such articles of food as consist chiefly of sugar.

SWEET PEA. See LATHYRUS.

SWEET POTATO. See BATATAS.

SWEETS, a term applied in England, and by the board of inland revenue, to home-made wines, for the sale of which a special license is granted. It is also a term in far more general use for lozenges, comfits, and other preparations of sugar well known to children; they are the *confitures* of the French.

SWEETSER, CHARLES HUMPHREYS, 1841-71; b. Mass.; graduated at Amherst, 1862; entered literary life, and was one of the founders of the *Round Table*, and of the *Evening Mail*, with which he was connected until 1869. He wrote a history of Amherst college, a collection of college songs, and an *Invalid's Guide to the North-west*.

SWEET SOP, *Anona squamosa*, a fruit of the same genus with the custard apple (q.v.). It is produced by a small bush, with lanceolate leaves, a native of the warm parts of America, and much cultivated in Brazil, the West Indies, and generally in tropical countries. The fruit is greenish, and resembles an artichoke in size, in form, and in its scaly covering. The pulp is soft, somewhat mealy, sweet, and luscious; with a musky aromatic odor and flavor. It is much used both in the East and West Indies, generally raw, but sometimes cooked. Notwithstanding its foreign origin, it has proved the staff of life to the people of Hindustan in seasons of famine. The seeds are acrid, and the powder of them is used to destroy insect vermin.

SWEETWATER, a co. in central Wyoming, having the territorial line of Montana for its n. boundary, and that of Colorado on the s., with a small portion of Utah; 35,000 sq.m.; pop. '80, 2,561—1445 of American birth, 542 colored. It is intersected in the s. by the Union Pacific railroad running through the coal region. It is drained by the river Big Horn in the n., the Green river in the s., and the Wind, Big Sandy, and Sweetwater rivers. The surface is mountainous, containing the Big Horn and Sweet-

water ranges of the Rocky mountains, and immense plains in the Wind river country are occupied by the Shoshone Indian reservation. Through the Wind river mountains, by Fremont's peak and the South pass, was formerly the only route from the Atlantic to the Pacific. The pass is 7,857 ft. above the level of the sea, several m. in width, and reached by a gradual ascent. Gold is found; also granite and iron ore; and in the co. are saw and grist mills. Co. seat, Queen River City.

SWEET WILLIAM. See PINK.

SWEET WOOD. See CASCARILLA.

SWELL, in music, a set of pipes in an organ with a separate keyboard, and forming a separate department, which are capable of being increased or diminished in intensity of sound by the action of a pedal on a series of shades or shutters overlapping each other like Venetian window-blinds, within which the pipes in question are inclosed. On a well-constructed swell, a practiced performer can imitate not only a gradual *crescendo* and *diminuendo*, but also a *sforzando*, a very small opening suffering to make an immediate burst on the ear; while, when the shutters are closed, an imitation of an echo is produced.

SWETCHINE, or **SVETCHIN**, ANNE SOPHIE, 1782-1857; b. Moscow; the daughter of Soimonoff, who was one of the founders of the academy of sciences at Moscow. She was brought up at the court of Catharine II., and in 1799 married gen. Swetchine. She gathered round her Russians and French emigrants of distinction, and her *salon* at St. Petersburg became very celebrated. In 1815 she was converted to Roman Catholicism, and then removed to Paris. After her death, her literary executor, De Falloux published *Mme. Swetchine, sa vie et ses œuvres* (1859); her *Lettres* (1862); *Journal de sa Conversion* (1863); and *Lettres Inédites* (1866).

SWIETEN, GERARD VAN, 1700-72; b. Leyden, Holland; educated in his native place, and at Louvain; studied medicine at Leyden with Boerhaave, who obtained him the professorship of medicine in 1725. He was a Roman Catholic, and obliged for that reason to resign his chair. He was first physician to Maria Theresa of Austria, 1745, who made him a baron of the empire. By his influence the university was rebuilt, and a system of clinical instruction established at Vienna. He was opposed to the practice of vaccination. For 8 years he lectured on Boerhaave's *Institutes*, and adapted his system to that of his master; content to engraft the result of his own experience upon it instead of founding a school of his own. Besides his comments on Boerhaave, he wrote treatises on the diseases of armies and on epidemics. A statue to his memory was placed in the university by Maria Theresa.

SWIETENIA. See MAHOGANY.

SWIFT, *Cypselus*, a genus of birds of the swallow family. The distinctive characters of the group, of which the true swifts are the type, are noticed in the article SWALLOW. The swifts, like the swallows, are widely distributed, and some are only found in tropical countries; others are birds of passage, and spend the summer in colder parts of the world. Many of the swift group are often popularly called swallows, as that which produces the edible nests of the East Indies. In the genus *Cypselus*, as now restricted, the tail is generally forked, the legs and toes feathered, and very small and weak, all the four toes directed forward. The birds of this genus pass most of their time in the air, and even copulate on the wing. The wings are longer than in any other bird; and the internal structure, even of the skeleton, is peculiarly adapted to prolonged flight. The anatomy more resembles that of humming-birds than of true swallows.—The COMMON SWIFT (*U. apus*) is common in almost all parts of the n. of Europe and of Asia in summer, retiring to tropical or subtropical regions in winter. It occurs even in Lapland. Its residence in its summer quarters is much shorter than that of swallows; and it is worthy of notice, that the swift is seldom to be seen along with any of the swallows or martins, the different kinds choosing different localities, even although very close together. The swift is easily recognized in its flight by the remarkably sickle-shaped wings, and its slight scream is very different from the twitter of the swallow. It is black, with a white throat. It makes its nest in holes of rocks or of walls, often in those of houses. The nest is formed of bits of straw, dry blades of grass, and bents, feathers, and other such substances, which are apparently glued together by a mucous secretion. The swift sometimes builds in hollow trees. Swifts, like swallows, seem to return to the same place to make their nest, year after year, and repair the old nest, instead of making a new one.—The ALPINE SWIFT, or WHITE-BELLIED SWIFT (*U. alpinus*), is rarely seen in Britain, but is common in the more southern countries of Europe. It builds in high rocks, sometimes in steeples. It is larger than the common swift, and is the largest of the British *Hirundinidae*. Its wings are even longer in proportion than those of the common swift. Its voice is sweet, not a scream like that of the common swift.—The AMERICAN SWIFT (*Chaturus pelagius*) has the hind-toe directed backward, and the tail feathers stiff and pointed, as in woodpeckers. It is a small bird, not above 4½ in. in entire length, but 1 ft. in extent of wing. The general color is brownish black, with greenish reflections, the throat grayish white, the under parts grayish brown. The nest is made of small dry twigs, which the bird breaks off from the tree, and carries away in its feet; and they are attached by means of the saliva, to the rock, wall, or hollow tree where the nest is made. From its frequently building in chimneys, this species

is known as the *Chimney Swallow* in North America. Great numbers often build together, sometimes choosing for this purpose an unused chimney in a town.

SWIFT, a co. in w. Minnesota, drained by the Minnesota, Chippewa, and Pomme de Terre rivers; intersected by the St. Paul and Pacific railroad; about 850 sq.m.; pop. '80, 7,473—4,392 of American birth. The surface is mostly level, with little timber. The soil is extremely fertile. The principal production is wheat. Co. seat, Benson.

SWIFT, JONATHAN, the greatest of English satirists, and the most original writer of his age, was born in Dublin, but of English parents, on Nov. 30, 1667. He was a posthumous child, reared amid circumstances of abject poverty and dependence, the recollection of which galled his proud irascible spirit, and embittered much of his future existence. He was supported by relatives, and educated at Kilkenny school and Trinity college, Dublin. He proved a negligent and turbulent student, more intent on personal satires and political rhymes than academical honors: but he remained at college about seven years. He then removed to England, visited his mother in Leicestershire, and by her recommendation was admitted into the house of sir William Temple, who had long known the Swift family. He seems at first not to have conciliated the regard of the retired minister, for in the following year (May, 1690), Temple made an offer of the services of his protégé to sir Robert Southwell (then about to proceed to Ireland as secretary of state), recommending him as diligent and honest, qualified either to wait on sir Robert as a gentleman, or to write under him as a clerk. No appointment followed; Swift remained with Temple, studying hard, till 1694, when he went to Ireland, took orders in the church, and obtained a small living, which he threw up in two years, and returned to England, in consequence of Temple, who missed his society and assistance, urging him to come back. Temple died in 1698, and Swift in the following year, published his posthumous works, after which he again repaired to Ireland, obtaining from lord Berkeley some church preferments, including the vicarage of Laracor, worth in all about £400 per annum, which was all the professional income he enjoyed till he was appointed dean of St. Patrick's, in his 46th year. Before this, he had written the wildest and wittiest and most powerful satirical work of the 18th c., *The Tale of a Tub* (1704), also a few essays on ecclesiastical subjects, some inimitable ridicule of astrology under the name of Isaac Bickerstaff, and poetical pieces possessing a peculiar vein of humor and description. In 1710 he went over to the Tories, conceiving himself neglected by the Whig ministers, and exerted himself strenuously in behalf of his new allies, Harley and Bolingbroke. He wrote papers in *The Examiner* (1710); a *Letter to the October Club* (1711); *The Conduct of the Allies* (1712); *The Barrier Treaty* (1713), and innumerable pasquinades against the Whigs, whom he "libelled all round." He had become, as it were, a great and formidable power in the state, yet could extort no higher preferment for himself than the deanery of St. Patrick's. His party was overthrown by the death of queen Anne; and in 1714 Swift "commenced Irishman for life," with strong reluctance and disgust. In time, however, he took interest in Irish affairs, and identified himself with Irish feelings and prejudices. Hatred to Walpole and the English government quickened his activity; and his resistance to Wood's copper coinage—a scheme for supplying Ireland with copper money by an English patentee—raised him to the highest pinnacle of popular favor. His *Drapier Letters* (1724) produced quite a ferment in Ireland, and compelled the government to abandon the scheme of the coinage. Two rewards of £300 each had been offered for the unmasking of the Drapier, but not a traitor, as he says, could be found to sell him. The triumphant author made his last visit to England in 1726, and published his *Gulliver's Travels*, the most universally popular of all his works. He next joined with Pope, Arbuthnot, and Gay in publishing three volumes of *Miscellanies*, after which he returned to Ireland (Oct., 1727), and never left it again. He was subject to fits of giddiness and deafness, which increased in frequency and intensity as he grew old; he brooded over the anticipated madness which he foreboded would be his future lot; his temper, always irritable and gloomy, became more violent and morose, the effect of cerebral disease, and his memory and other faculties gave way. There was also a deep and secret grief: the fate of two ladies, known as Stella and Vanessa, had been inseparably entwined with his own destiny; both had sacrificed for him all but honor, and had sunk under disappointed hopes and blighted affection. We cannot here trace the painful story, which is still involved in mystery, but for a time the retribution of Swift was terrible. He rallied, however, and wrote some of his best minor pieces after this period. Among these are *The Grand Question Debated; On Poetry, a Rhapsody; The Legion Club; Verses on the Death of Dr. Swift*; and that extraordinary prose tract, *The Modest Proposal*, a masterpiece of irony, in which he proposes to relieve the distresses of the poor Irish by converting their children into food for the rich. The last three years of Swift's life were passed in almost total silence in the hands of keepers. He died Oct. 19, 1745.

It would be superfluous to attempt in our brief space to characterize the genius of the immortal dean of St. Patrick's. Shakespeare alone among English authors has received a greater amount of criticism and annotation. From Johnson to Thackeray, the most brilliant critics and biographers have employed themselves in elucidating his strange and sad history, and in estimating his writings. As a consummate master of ridicule and irony, possessing great powers of wit, invention, illustration, and analogy; possessing also the dramatic faculty that enabled him to assume and portray varieties of character;

and as writing a pure, perspicuous English style, unsurpassed for strength and simplicity, Swift must ever be a model in our language and literature. His misanthropy, or degradation of human nature—his Yahoos, Strulbrugs, daring irreverence, and indelicacy, are of course indefensible. He had a total incapacity, as De Quincey remarks, for “dealing with the grandeurs of the human spirit, with religion, with poetry, or even with science, when it rose above the mercenary practical.” His business was with the world—with the follies, vices, and absurdities of men. And his poetry is the same as his prose; it may come under his definition of a good style, “proper words in proper places,” applied to ordinary topics, but is wholly wanting in passion, elevated feeling, and imagination. A complete edition of his works, in 19 vols., was published by sir W. Scott (1815). See also Roscoe’s edition (1853), and *Life* (unfinished), by John Forster (1875).

SWIFT, JOSEPH GARDNER, LL.D., 1783–1865; b. Mass.; in 1802 graduated at West Point, the first graduate from the academy. He was commissioned in the engineers, rose to be chief of the corps with rank of colonel, and in the war of 1812 served on Pinckney’s staff and later had charge of the defenses of New York. In 1815 he was superintendent and inspector of West Point; resigned in 1818, and became surveyor of the port of New York. From 1829 to 1845 he was engaged in the harbor improvement of the great lakes, and in this period superintended the construction of the New Orleans and lake Pontchartrain railroad, a work of great difficulty on account of the swamps. In 1833 he was chief engineer of the New York and Harlem railroad.

SWIFT, WILLIAM H., b. Mass., 1800; educated at West Point. He joined Long’s Rocky mountain expedition in 1818, and was on topographical duty, 1821–32, making surveys on the Chesapeake and Ohio canal, the Florida canal, and several railroads. For the ten years from 1832 he was attached to the geodetic survey of the Atlantic coast, supervising the river and harbor improvements, 1837–42. He was also constructing engineer of the Western railroad in Massachusetts, 1836–40. He supervised the construction of the Minot’s ledge light-house, 1847–49. Resigning from the army in 1849, he became president of the Philadelphia, Wilmington and Baltimore railroad, and afterward of the Western railroad, and the Illinois and Michigan canal.

SWILLY, LOUGH, an inlet of the Atlantic on the n. coast of Ireland, in the county of Donegal, enters between Dunaff head on the e., and Fanad point, on which there is a light-house, on the west. It penetrates the country in an irregular, but generally s. direction, is about 25 m. in length, and at its entrance, where it is widest, it is 3½ m. broad. On the eastern shore is the small town of Bunerana, much resorted to for sea-bathing; and in front of which is a roadstead, capable of accommodating the largest men-of-war.

SWIMMING. The art of swimming is so exceedingly useful, not only as a bracing summer exercise, but as a means of preserving life, that it should be acquired by every young person. Considering the numerous risks run by all human beings, especially by the inhabitants of maritime countries, of being accidentally plunged into the water; and how greatly the chances of being saved are increased by the power of keeping one’s self afloat for even five minutes, it is surprising that the art of swimming does not form an essential element of education among all classes. With our limited space it would be needless to attempt giving directions that would be of any practical value. In many cities there are now swimming-schools, where professional instruction may be had. When these are not available, any acquaintance who can swim will give his aid until the elementary movements and the necessary confidence are acquired. Even without help, by keeping in safe water, and by perseverance, the art will be acquired as by instinct.—See Chambers’s *Information for the People*—“Out-of-door Amusements;” Routledge’s *Hand-book of Swimming and Skating*; and *The Boy’s Own Book*.

SWINBURNE, ALGERNON CHARLES, one of the first of living English poets, is the son of admiral Charles Henry Swinburne, by lady Jane Henrietta, daughter of the third earl of Ashburnham, and was born in London on April 5, 1837. He entered as a commoner at Balliol college, Oxford, in 1857, but left the university without graduating. His first literary venture, a volume published in 1861, containing two plays, *The Queen Mother* and *Rosamund*, attracted little attention; but *Atlanta in Calydon*, a tragedy, which appeared in 1865, at once established his reputation. Afterward came *Chastelard*, a tragedy (1865); *Poems and Ballads* (1866); *A Song of Italy* (1867); *Siena* (1868); *Songs before Sunrise* (1871); *Bothwell*, a tragedy (1874); *Erechtheus* (1875); and a new series of *Poems and Ballads* in 1878. Swinburne belongs to what has been aptly called the “fleshy school” of poetry, and even those who most admire his power of poetical expression, richness of coloring, and happy lyrical effects must deplore the sensuous tone of his muse. He has also been severely animadverted upon for the wanton violence with which he attacks the most sacred beliefs of his fellow-men. Swinburne is well known in the department of poetical criticism. A collection of his *Essays and Studies* was published in 1875; his *Note on Charlotte Brontë* in 1877.

SWINDON, an old market-t. of Wilts. 77 m. w. of London by the Great Western railway. It contains a handsome church, large corn-exchange, and excellent shops. About a mile n. of the town is Swindon junction, the great central establishment and manufactory of the Great Western railway company.

A considerable town has risen around the station, called the New Town, and consisting for the most part of dwellings for the employees of the railway. There are also a large and remarkably beautiful church, a public park, library, and mechanics' institution. Pop. of Old Town, '71, 4,092; of New Town, 7,628.

SWINE. See Hog, *ante*.

SWINE-PLAGUE, or HOG CHOLERA, an infectious disease produced by a bacteroid schizophyte, a microscopic organism having the power of indefinite multiplication in the system. The symptoms and pathological conditions vary considerably, depending upon the virulence of the disease, this depending very greatly upon the number of animals kept together, crowding greatly aggravating the disease. At the commencement of the attack the animal is generally seized with a shivering, which may last from a few minutes to several hours. There is also frequent sneezing and more or less coughing. The temperature of the body is also increased, ranging from 104° to 106° Fahr. but this symptom is variable, and not to be relied upon; and it is difficult to ascertain the temperature of a hog. The shivering, coughing, and sneezing are soon followed by loss of appetite and the rough appearance of the coat. Drooping of the ears is characteristic, and sometimes the animal attempts to vomit. Swelling of the head often takes place, and eruptions appear on the ears and other parts of the body. There is frequently bleeding from the nose, swelling of the eyelids and partial or total blindness, accelerated breathing; sometimes constipation, and sometimes diarrhea. There is rapid emaciation, and a vitiated appetite for dung and dirt, and a peculiar, offensive odor to the exhalations which is characteristic. This odor is so penetrating as to be observed in a large herd at the distance of half a mile. On examining the chest by auscultation a rubbing sound is heard which indicates inflammation of the pleural membrane. Sometimes there is extensive ulceration and sloughing of the snout and gums. If the subjects have been recently ringed with wire in the nose, the wounds thus made have a great tendency to ulcerate, and the disease may be communicated through wounds or abrasions of any kind. Post-mortem examinations reveal more or less hepatization of the lungs, with accumulation of blood, serum, and exudation in the lung tissue. Sometimes the solidification from hepatization is sufficient to cause the lung to sink in water. Sometimes the hepatization occurs only in isolated places, but sometimes extends over the whole lung. Gray and red hepatization may exist side by side. The lymphatic and mesenteric glands are always more or less enlarged. There is generally more or less exudation of plastic material, and more or less adhesion between the lung and the walls of the chest. Sometimes the adhesion involves the whole lung. The heart is generally more or less affected. Sometimes it is flabby and dilated, but more frequently congested, the capillaries, particularly of the auricles, being gorged with blood. Nearly all cases present characteristic morbid changes in the upper part of the large intestine, consisting of ulcerous tumors of the mucous membrane, varying in size from a pin's head to that of a quarter of a dollar. The other intestines are similarly affected, although in a less degree. Ulcerous tumors are also sometimes found upon the gall bladder and upon the mucous membrane of the stomach. The serous membrane of the abdominal cavity is also inflamed, so that there will be adhesions between different parts of the intestines, or between them and the peritoneal lining of the abdominal walls. Indeed, in the worst cases, it may be said that scarcely an organ escapes sufficiently not to exhibit lesions visible to the naked eye. A microscopic examination of the blood, or blood serum, or exudations, reveals great numbers of schizophytes in various stages of formation, some in separate minute globules, of micrococcus stage, some in aggregated masses, and some in bacillus rods. The disease is communicable to other animals by inoculation, and rats may contract it and cause it to spread. Dogs appear to have but little susceptibility, but do sometimes contract the disease. The extreme cold of winter checks the spread of the complaint, but the disease germs, or schizophytes, are not killed by it, although the thermometer may mark 30° below zero. The above information is chiefly taken from the reports of Dr. H. J. Detmers of Chicago to the governmental agricultural bureau at Washington; and the following is from a paper read before the state microscopical society of Illinois, April 8, and published in *Science* of May 7, 1881: "1. It has been and can be everywhere observed, where swine-plague is prevailing, that the infectious principle floating in the air is attracted and taken up by sores, wounds, and even scratches, but does not enter the animal organism through the whole skin and through perfectly healthy respiratory mucous membranes. 2. Antiseptics, or medicines which are either directly poisonous to the lower forms of organic life or destructive to those conditions under which low forms of organic life thrive and develop, and among those antiseptics, especially carbolic acid, iodine, hyposulphite of soda, benzoate of soda, thymol, etc., have proved to constitute almost sure prophylactics. . . . Further, the various antiseptics which have proved to be good prophylactics are very dissimilar in their chemical affinities and actions, and their prophylactic effect cannot very well be explained if the infectious principle were a chemical agency, a virus, or a poison, but is explained if the same consist in something endowed with life and power of propagation. . . . 6. If the cause and infectious principle of the swine-plague were a chemical poison or virus, one would suppose a cessation of the morbid process would be impossible, and an animal would never recover while its organism contained an abundance of the infectious principle in an effective

condition, as is undoubtedly the case, because convalescents and animals nearly recovered frequently communicate the disease, even in a fatal form, to other healthy pigs. Further, the fact that an animal, once recovered, possesses but little predisposition for future infection, or is seldom attacked a second time, even if ever so much exposed, and then only contracts the disease in a comparatively mild form, could never be explained; but the whole presents an entirely different aspect, and admits of explanation if low and minute forms of organic life, such as the schizophytes of swine-plague, which by developing and multiplying finally destroy or exhaust in an animal organism the conditions necessary to future development and propagation, constitute the cause and the infectious principle." Dr. Detmers says that the swine-plague schizophytes, although having the same general characteristics when cultivated in fluids artificially as when developed in the animal, have less uniformity in size and develop rather slower. He concludes that they are less vigorous; and therefore when an animal is inoculated with them the disease produced is milder than when propagated in the ordinary manner, or by material taken from the body of a diseased hog. Sometimes, however, owing to other circumstances, inoculation with cultivated schizophytes produces a virulent form of the disease. In regard to prevention, Dr. Detmers, in his report to the commissioner of agriculture, July, 1879, takes the ground that measures of extermination must be thorough. He advises: 1, "that a competent and reliable person be appointed in every county, or where a great many hogs are raised, and where the country is thickly settled, in every township, with authority to institute, superintend, and enforce a strict execution of such measures of extinction and prevention as may be authorized by law; 2, that every owner of hogs or pigs must be compelled by law to inform the above officer, say within 12 hours after the occurrence, of every case of swine-plague in his herd, or any herd, that may come to his knowledge; 3, that every hog or pig showing symptoms of swine-plague must be immediately destroyed and buried from 4 to 6 ft. deep, or cremated, and that all exposed hogs be kept under quarantine for several weeks or killed; 4, that all infected premises be thoroughly cleaned and disinfected, and remain unoccupied for six weeks or two months; 5, that no hog or pig be allowed to run at large or to have access to running water if swine-plague has made its appearance within 10 m.; 6, that railroad companies and other public carriers be forbidden to receive and load hogs from any township or county after having been notified by the proper officer that swine-plague is there existing, except by special permit of such officer, and various other restrictions. The treatment most relied on is good care, uncontaminated and pure food and water, perfect cleanliness, and separation from sick animals and all other sources of infection. Medicines avail but little, and patent quack nostrums are a curse."

SWINEMÜNDE, a maritime and fortified t. of Prussia, province of Pommern, is situated on the island of Usedom, at the entrance of the narrow channel of Swine, which connects the Grosses Haff (into which the Oder flows) with the Baltic. Swinemünde as in some sense the port of Stettin (q.v.), carries on a considerable commerce, and has also valuable fisheries, but it is chiefly noted for its excellent sea-bathing, for which it is much frequented. Swinemünde has regular steam-communication with Stettin (daily), Rügen, and Copenhagen. The light-house of Swinemünde is the loftiest in the world, being 210 feet high. Pop. of Swinemünde '75, 8,045.

SWING, a cognomen assumed by senders of threatening letters during the period when the irritation of the agricultural laborers of England against their employers was at its height—viz., from 1830 to 1833. The cause of this misunderstanding arose from a widespread belief on the part of the laborers, that the use of machinery would greatly lessen the demand for labor, and consequently produce a general reduction of wages; it was also intensified by the savage severity with which the game-laws were enforced, and by other hardships to which the laboring-classes in the country considered themselves unjustly subjected. As any inattention on the part of landlords or farmers to the demands contained in these threatening letters was almost invariably followed by the burning of stacks, farm-buildings, etc., the employers of labor became so terrified that implicit obedience was paid to the dictates of "captain Swing." It is not to be wondered at that, with such encouragement, "swings" became numerous, and their demands more insolent; but the apprehension and punishment of a number of them gradually brought about a cessation of the outrages.

SWINTON, WILLIAM, b. Edinburgh, 1833; removed to the United States when ten years old, and pursued his studies at Amherst college. In 1853 he was a teacher in a female academy in Goldsborough, N. C.; but soon after settled in New York, where he devoted himself to study, and to making translations from the French, the most important being that of Rousseau's *Confessions*. On the outbreak of the rebellion he was sent to the front as war-correspondent for the *New York Times*, and served principally with the army of the Potomac, of whose career he was afterward a historian. Soon after the war he was appointed professor of *belles-lettres* in the university of California at Oakland. Of late years he has devoted himself to writing educational works. He has published *Rambles among Words*; *Campaigns of the Army of the Potomac*; *The Twelve Decisive Battles of the War*; and geographies, grammars, and reading-books.

SWISS GUARDS, first employed in the French service in 1616. It was the policy of the royal family to render these guards personally faithful to themselves, and to

SWISSHELM, JANE G. C.; b. Wilksburg, Penn., 1816; editor of the *Pittsburg Saturday Visitor*, 1845-56; of the St. Cloud (Minn.) *Visitor*, 1858; and of the *St. Cloud Democrat*, 1858. She has been a contributor to *Neal's Gazette*, *The Dollar Newspaper*, *The Spirit of Liberty*, *The Commercial Journal*, *New York Tribune*, etc.; and pub. *Letters to Country Girls*. She deals forcibly with political and social life in the interest of reform.

S'il pleut le jour de Saint Médard,
Il pleut quarante jours plus tard;
S'il pleut le jour de St. Gervais et de St. Protais,
Il pleut quarante jours après.

SWITZERLAND (Ger. *Schweiz*; Fr. *Suisse*; It. *Svizzera*) is an inland country of Europe, situated between 45° 48' to 47° 49' n. lat., and 5° 55' to 10° 30' e. long. Its greatest length from e. to w. is 180 m., and its greatest width from n. to s. 130 miles. Its superficial area, without including lakes, is 15,233 sq.m., or one-fourth of that of England and Wales. In 1878 the pop. of Switzerland was close on 2,800,000. The following table gives the results of the census of 1870:

CANTONS.	Area in English Square Miles.	Population Dec. 1870.
Zürich	659	284,786
Bern	2,615	506,465
Lucerne	480	132,328
Uri	418	16,107
Schwyz	358	47,705
Unterwalden (Upper)	186	14,415
(Lower)	112	11,701
Glarus	265	35,150
Zug	91	20,993
Freiburg	632	110,832
Soleure	292	74,713
Basel (town)	15	47,760
(district)	166	54,127
Schaffhausen	118	37,721
Appenzell (exterior)	102	48,726
(interior)	61	11,909
St. Gall	781	191,015
Grisons	2,706	91,782
Aargau	538	198,873
Thurgau	384	93,300
Tessin, or Ticino	1,082	119,610
Vaud	1,226	231,700
Valais	2,016	96,887
Neuchâtel	308	97,234
Geneva	110	93,239
Total	15,721	2,669,147

Surface.—Switzerland is the most mountainous country of Europe. Its principal chains are the Alps (q.v.) and the Jura (q.v.). The former run from e. to w. along its southern or Italian frontier. Their ramifications fill more than one-half of the country, and terminate along a line which may be traced from Vevey, on the lake of Geneva, to mount Moleson and mount Napf, across lake Zug, to the southern shores of the lakes of Zürich and Wallenstadt, and Sargans on the Rhine. The mean elevation of the highest chain is from 8,000 to 9,000 feet. The Jura run n.e. from the western corner of Switzerland. They consist of a series of parallel ridges inclosing long and narrow valleys, and their mean elevation does not exceed 4,000 feet. In the angle formed between them and the Alps lies the plain of Switzerland, a table-land 100 m. in length, and from 20 to 30 m. in width, with a mean elevation of about 1400 ft. above the sea. It is not absolutely level, but covered with elevations, which seem very unimportant, however, when contrasted with the huge masses of the Alps and Jura. It has been described, and not inaptly, as a corner of southern Germany, penetrating like a wedge between France and Italy. The communication between the plain of Switzerland and the German valleys of the Danube and Rhine is not, however, continuous. The plain on the e. terminates in a third hilly tract—the Thur hill-country, which lies between the lakes of Zürich and Constance, and which, to some extent at least, forms a barrier between the plain of Switzerland and Germany. The Jura, the plain, and the hill-country are, then, the great divisions of northern Switzerland. The divisions of the Alpine region are more strongly marked in nature. A glance at the map will show that the chains which overspread it radiate from a mountain knot lying to the w. of the Grimsel pass. They isolate and inclose (1) the valleys drained by the Rhone, which connect Switzerland with southern France; (2) Ticino, drained by streams which descend to the Po, and have at all times brought this country into close communication with Italy; (3) The Grisons, the most sequestered valleys of Switzerland, drained by the tributaries of the Rhine and Danube, and shut out by mountains from the lower basins of these rivers; (4) The Bernese Oberland, which slopes toward the western extremity of the Swiss plain; (5) The district of the forest cantons—Schwyz, Uri, and Unterwalden—surrounding the lake of Lucerne, and which slope toward the eastern extremity of the plain, and seem a great mountain fortress erected in the very heart of Switzerland, to protect the plain against German invasion.

Geology is of little importance in explaining the general geography of Switzerland. It may, however, be stated that in the southern Alpine region the rocks are crystalline; that in the northern Alpine region they belong to the jurassic and other upper secondary strata; and that in the plain and the great part of the hill-country they consist of loose tertiary sands and clays, which supply the best agricultural soils of Switzerland. Those rocks and formations in which mines and coal chiefly abound are absent.

Climate.—In Switzerland the climate chiefly varies with elevation above the sea-level. At a height exceeding 9,500 ft., the mountains are covered with perpetual snow, which descends along the hollows in glaciers (q.v.) to a much lower level, and in this way covers the elevated part of the country with a vast sea of ice. Below the level of perpetual snow, the surface of Switzerland has been divided into a series of belts, characterized by different climates and productions. The highest of these, lying between the snow and the level of 6,900 ft., has been called the upper Alpine region. In it the glaciers fill the valleys, but plants clothe the scanty soil of the ridges. The second or lower Alpine belt descends to 4,800 feet. It is a country of pastures, in which shrubs but no trees make their appearance. The Righi pass, the Grimsel hospice, and the Splügen are included in it. The third belt descends to 4,350 feet. The meadows still abound in it, but forests of firs and maples in many parts replace them. It includes Urferthal and Oberengadin. The fourth belt sinks to 3,000 feet. The forests still abound, the beech being the prevailing tree. The meadows are excellent, and rye and barley are successfully cultivated. It includes Weissenstein, Grindelwald, and Engelsberg. The fifth belt lies above 1800 feet. In it the oak and walnut are the characteristic forest trees. Spelt and the best wheat are cultivated. It includes Bern, Coire, and St. Gall. The last belt sinks to 750 feet. In it the chestnut is the characteristic tree; the mulberry and the vine are extensively cultivated, and wheat is the grain chiefly grown. This belt includes the greater part of the Swiss plain, and sinks to its lowest level in the valley of the Rhine, between Constance and Basel, and the banks of lake Zürich and the lago Maggiore. In the last district the vegetation is that of northern Italy. At a higher elevation than 6,400 ft., Switzerland is only inhabited by herdsmen during the summer months. At this limit, however, permanent abodes begin to make their appearance; and at 4,000 ft. there are many villages. The most populous part of Switzerland, however, lies between 1250 and 2,150 feet. The temperature of this region is fairly represented by that of Zürich, which we will compare with that of London. The temperature of Zürich is in winter 30.34°; in spring, 47.25°; in summer, 64.15°; in autumn, 49.05°; for the year, 47.95°. The temperature of London is in winter, 38.22°; in spring, 48.34; in summer, 61.74°; in autumn, 50.29°; for the year, 50.50°.

Productions.—In Switzerland, where good coal is not to be had, and where the houses are built of wood, the forests, which cover one-sixth of the whole surface, acquire very great importance. Wood-cutting is one of the chief employments of the people. The trees cut down in the highlands are deprived of their branches, and shot with innumerable

able rapidity over the slopes to the valleys below, whence they are removed by rafts, not only to different parts of Switzerland, but to France and Germany. It is, however, the mountain-pastures and the meadows, forming two-fifths of the whole surface of the country, that supply the chief occupations of the people—those of herdsmen and shepherds. During the summer the cattle are driven into the mountains, and tended by herdsmen, who take up their abode in the rude wooden huts known as *châlets*, and there the butter and cheese are made. In summer it is estimated that there are in Switzerland upward of a million of horned cattle, one-fourth of which consists of milch cows. The produce of the dairy annually is valued at between one and two millions sterling. The best breeds of cattle are those of Saanen and Simmenthal in Bern, Gruyères in Freiburg, Schwyz, Zug, Entlebuch, Pralligau in the Grisons, and Glarus. The best cheese is made at Emmen, Saanen, Simmenthal, Gruyères, and Ursern. The sheep of Switzerland are of inferior breed, and their wool is short and coarse; but the goats are numerous and fine. More than two-thirds of Switzerland does not supply corn enough to feed its inhabitants. The plain, however, is a fertile agricultural country. In Vaud and Neuchâtel the cultivation of the vine is the chief occupation of the people; and in the Thur hill-country, more particularly on the shores of the lake of Constance, there are extensive orchards, in which are prepared cider and *kirschcasser*, the latter being a liquor largely consumed in Switzerland. It will give some idea of the extent to which Switzerland is cultivated to state, that out of every 100 sq.m. of surface, 30 are occupied by rocks, glaciers, and water; 20 by hill-pastures; 17 by forests; 11 by arable lands; 20 by meadows; and 1 by vineyards. In the uncultivated part of the country the bear, the wolf, and the larger birds of prey are still met with; and the chamois (q.v.) is hunted. The rivers and lakes abound with fine fish, and more especially with trout.

Manufactures.—The manufacturing districts are not scattered over the whole surface of the country; they are met with only on the northern frontier. The chief manufactures are: at Zürich, silk-stuffs, to the value of £1,600,000 annually, and cottons; at St. Gall and Appenzell, cottons; in Aargau and Glarus, cottons, linens, silks, and hosiery; at Basel, silk-stuffs to the value of £1,400,000, leather, paper, and tobacco; in Aargau and Lucerne, straw-plaiting; in Neuchâtel, watch-making and cotton printing; in Geneva, watch-making and jewelry. Although Switzerland is inland, its commerce in proportion to population has long exceeded that of any other continental country. The chief imports are corn, salt, salt-fish, raw silks, and cotton, fruits and tropical produce, and the metals employed in watch-making. The exports are wood and charcoal, cattle, tallow, cheese and butter, silks and cottons, watches and jewelry. Internal communication has long been facilitated in Switzerland by excellent roads, and every advantage has been taken of the lakes to introduce steam-navigation. The plain is now overspread from one end to the other with a network of railways, which in many directions send ramifications into the Alpine valleys, thus connecting closely all parts of the country.

Government.—Hitherto, the Swiss have been very much split into distinct communities by the great mountain-chains which separate the cantons. One of the results has been the weakness of the central power. Each valley has been intrusted with the making of its own laws, and the management of its own local affairs. The cantons are, in fact, to this day in a great measure separate states. They are divided into two classes, absolute democracies and representative democracies. In the former the chief power belongs to the *landesgemeinde*, an assembly of the whole adult male population, which meets once a year, to pass laws, and to regulate the taxes and expenditure of the canton. Uri, the Unterwaldens, Appenzell, and Glarus have constitutions of this kind. In the Grisons and the Valais, the people may be said to possess similar powers, as all measures must be approved of by them. In the other, the representative cantons, a great council is elected by the people, and to it are deputed most of the powers of the *landesgemeinde*. These local assemblies produce a remarkable effect on the Swiss people. Their debates have an importance far beyond that of an English town-council, or even of a colonial parliament, for their power is infinitely greater, and the population are more immediately interested in them. To the interest they excite is no doubt to be attributed in a great degree the intelligence and public spirit of the Swiss. Their greatest disadvantage lay in the power they formerly had to levy war against each other, and to resist the general government in conducting the foreign policy of the country. But these defects have been to a great extent remedied by the constitution of 1848, which forms the basis of the present constitution, which dates from 1874. It handed over the control of the army, the conduct of foreign affairs, the settlement of disputes between the cantons, and the management of the police and post-office, to a federal assembly (*bundesversammlung*) representing all the cantons. How far this assembly is entitled to interfere with the legislative action of the cantons, has not been very distinctly defined, but the tendency of legislation since its formation has been rather to trench than otherwise on their prerogatives. The federal assembly consists of two chambers—1st, the state council (*stände rath*); 2d, the national council (*national rath*). The former is composed of 44 members, 2 representing each canton; the latter, of 135 members, elected by the cantons in the proportion of 1 to 20,000 inhabitants. These bodies depute the executive authority to the federal council (*bundes rath*), consisting of seven members, and holding office for three years. The president is

merely one of the council, and he has none of the quasi-royal privileges of the American president. There is also a court called the federal tribune (*bundes gericht*), which acts as a high court of appeal, and consists of 9 members elected by the federal assembly. Different systems of law still prevail in the different cantons, which to some extent resemble each other, the most of them having grown out of the old German codes. Except in a few frontier cantons, the Roman law has not been much regarded. Until 1874 the law of the Catholic cantons prescribed, for certain offenses, various degrees of corporal punishment, exposure on the pillory, and public penance in the churches; but in that year capital and corporal punishment was abolished throughout the confederation. In Switzerland property is much subdivided; of 485,000 heads of families, no less than 465,000 possess landed property. In the absence of great landed estates there is no powerful aristocratic class. There are no titles of Swiss origin, families possessing such distinctions deriving them from abroad.

There is no standing army in Switzerland, but every citizen is obliged to serve as a soldier, and military drill is taught at all the schools. The Swiss regular force numbers 120,000; the reserve 92,000. The whole expense of the military establishment was, in 1878, estimated at 13,298,367 francs. The estimated national revenues amounted (1878) to 40,442,000 francs, and the expenditure to 42,818,000 francs.

Language and Religion.—In the sequestered valleys of the Grisons, two-thirds of the population still speak a Latin dialect known as the Romsaunsh; Italian dialects have penetrated up the valleys of Ticino; French patois has invaded western Switzerland by the Rhine and the valleys of the Jura, to Laufen, the frontier of Soleure, lake Morat, the Upper Saane, and Siders in the Valais. In the rest of Switzerland the dialects are German. Of every 1000 Swiss, 702 speak German, 226 French, 55 Italian, and 17 Romsaunsh. The Swiss reformation spread chiefly from Basel, Bern, and Geneva, and the chief Protestant districts are the countries communicating with these towns. The Alpine region is almost entirely Roman Catholic, the seven Catholic cantons being Lucerne, Zug, Schwyz, Uri, Unterwalden, Valais, and Ticino. Out of 1000 Swiss, 411 are Roman Catholics, 587 Protestants, and 2 Jews.

Education.—In no country is elementary instruction more widely diffused. Parents are compelled to send their children to school, or have them privately taught from six to twelve. There are universities on the German model at Basel, Bern, and Zurich, and academies on the French plan at Geneva and Lausanne. The number of clubs for scientific and literary, musical and social purposes, is most remarkable. There are no pursuits to which a class of men can devote themselves which are not represented by societies in Switzerland. The local political assemblies and other public meetings give ample employment to the newspaper and periodical press. In Switzerland there are accordingly 188 political journals, and 167 periodicals devoted to literature and science. There are 40 daily papers. This active intellectual life is, however, chiefly confined to the Protestant cantons.

History.—Switzerland was in Roman times inhabited by two races—the Helvetii, supposed to have been Celts, on the north-west; and the Rhetians (of whose origin we know nothing) on the south-east. After the conquest of Gaul, both races adopted the language and habits of Rome. When the invasions took place, the Burgundians settled in western Switzerland; while the Alemanni, another Germanic tribe, took possession of the country east of the Aar. A third Teutonic people, the Goths, entered the country from Italy, and took possession of the country of the Rhetians, which nearly corresponded with the Grisons. The Burgundians adopted Christianity in the end of the 5th c.; the Helvetii retained their old pagan creed until the 7th c., when they were converted by Irish monks, who founded abbeys and churches, which survive to our own time. Switzerland, in the early part of the middle ages, formed part of the German empire, and feudalism sprang up in the Swiss highlands even more vigorously than it did elsewhere. During the 11th and 12th centuries, the greater part of Switzerland was ruled on behalf of the emperors by the lords of Zähringen (q. v.), who did much to check civil wars, and to promote the prosperity of the towns. They, however, became extinct in 1218, and then the country was distracted by wars which broke out among the leading families. The great towns united in self-defense, and many of them obtained imperial charters. In 1273, Rudolf of Hapsburg, a Swiss nobleman who had favored the independence of the towns, became emperor. After doing so, he continued the same policy; but his son, Albert I. (q. v.), took another course. He attacked the great towns and was defeated. The leading men of the forest cantons, which for ages had yielded a merely nominal recognition of the empire, and had acknowledged no feudal superior, met on the Rütli meadow, on Nov. 7, 1307, and resolved to expel the Austrian bailiffs or landvögte. See TELL. The war terminated in favor of the Swiss at Morgarten in 1315. Schwyz, Uri, and Unterwalden, with Lucerne, Zürich, Glarus, Zug, and Bern, eight cantons in all, in 1352, entered into a perpetual league, which was the foundation of the Swiss confederation. Other wars with Austria followed, which terminated favorably for the confederates at Näfels (q. v.) and Sempach (q. v.). In 1415, the people of the cantons became the aggressors. They invaded Aargau and Thurgau, parts of the Austrian territory, and annexed them; three years later, they crossed the Alps and annexed Ticino, and constituted all three subject states. The Swiss were next engaged in a struggle on the French frontier with Charles the

hold of Burgundy. They entered the field with 34,000 men, to oppose an army of 60,000, and yet they were successful, gaining the famous battles of Granson and Morat in 1476. In 1481 the towns of Freiburg and Soleure were admitted into the confederacy. In 1499 the emperor Maximilian I. made a final attempt to bring Switzerland once more within the bounds of the empire. He sought to draw men and supplies from the inhabitants for his Turkish war; but in vain. He was defeated in six desperate engagements. Basel and Schaffhausen (1501), and Appenzell (1513), were then received into the confederation, and its true independence began. The abbacy of St. Gall, the cities of St. Gall, Mülhausen, and Bienne became associated states with a vote at the diet. Geneva, Neuchâtel, Valais, and the Grisons, also became associated states, but without a vote.

New troubles sprang up with the reformation. Zwingli began to preach in the beginning of the century, and Zürich, in 1523, adopted his opinions, and was followed by Bern and other cantons of the north. The forest cantons remained attached to the church of Rome. War broke out in 1531 between the Catholics and Protestants, and the former were successful at Cappel, where Zwingli was slain. This victory to some extent settled the boundaries of the two creeds in eastern Switzerland. In 1536, however, Bern wrested the Pays de Vaud from the dukes of Savoy and annexed it to their own territory. In the same year Calvin settled at Geneva, and the reformed doctrines spread throughout western Switzerland. During the thirty years' war Bern, which had become, since the conquest of Vaud, the leading canton, and Zürich, contrived to maintain with great skill the neutrality of Switzerland; and in the treaty of Westphalia, in 1648, it was acknowledged by the great powers as a separate and independent state. At this period the Swiss, in immense numbers, were employed as soldiers in foreign service, and the record of their exploits gives ample evidence of their courage and hardihood. Internally there was great stagnation. The constitution of the larger cantons became more aristocratic, that is to say, the mass of the people lost their power over the governing bodies. In Zürich, Schaffhausen, and Basel the governing councils were elected by the corporations; and in Bern, Freiburg, Soleure, and Lucerne, a few families had acquired permanent rule. At the end of last century there was widespread discontent with this state of matters; but the French revolution broke out, and wars followed, which left no time for its manifestation. In 1798 Switzerland was seized by the French. At the peace of 1815 its independence was again acknowledged. The new confederation was divided into 22 cantons, each of which was represented in a diet, which was appointed to hold its annual meetings alternately at Bern, Zürich, and Lucerne. The old abuses which had crept into the constitutions of the cantons were revived, and representation in most of them became based on property qualifications. Officials, the aristocracy, and the clergy joined to oppose innovations, and succeeded in doing so until 1830, when the French revolution broke out. Armed demonstrations were made against the towns, and universal suffrage was generally conceded. Basel town, however, held out; but the difficulty was settled by the separation of the town and country districts—the former remaining conservative, the latter becoming democratic. Geneva and Neuchâtel retained their old constitutions. The result of the changes was, however, that two-thirds of the whole population were allowed to take part in public affairs. The consequences were not what had been expected by the liberals, who found that they had not yet the means of strengthening the central power. In 1839 at Zürich, where Dr. Strauss had been appointed a professor of theology, a mob of peasants, headed by the Protestant clergy, overturned the government. In Aargau a struggle took place between the liberals and the Ultramontane party, which was settled, after long discussion, by an unsatisfactory compromise. In Valais, where universal suffrage had put power into the hands of the reactionary party, a war took place, in which the latter were victorious. They then ruled with a strong hand, and actually forbade the celebration of Protestant worship within the canton. In Lucerne, the headquarters of the Jesuits, the Ultramontane party acted even more extravagantly; they so persecuted their political opponents that the latter were compelled to leave the canton. These measures caused the greatest discontent. In 1844 a proposal was made in the diet to expel the Jesuits; but that body declined to act. The radical party then determined to resort to force; they organized bodies of armed men, called the free corps, which invaded the Catholic cantons, but they were defeated. Changes favorable to them took place in some of the cantons. The Catholic cantons then formed a league, named the Sonderbund, for defense against the free corps. There was a general clamor for its suppression, but in the diet only 10½ votes were in favor of that measure. The ruling party in Geneva had been with the majority, and this conduct led to a revolution in that city. One vote was thus gained against the Sonderbund. St. Gall added another; and a majority in the diet in 1847 declared the illegality of the Sonderbund, and decreed the expulsion of the Jesuits. In the war which ensued between the federal army and the forces of the Sonderbund, the former were victorious at Freiburg and Lucerne. The leagued cantons were made liable in all the expenses of the war, the Jesuits were expelled, and the monasteries were suppressed. An attempt was made by diplomatic notes to intimidate the Swiss government, but the revolution of 1848 broke out and prevented further interference. In the same year the radical party, convinced of the necessity of a more powerful central government, carried the constitution of 1848, of which we have already taken notice. Since

then the most important event which has taken place in Switzerland was a rebellion against the king of Prussia as prince of Neuchâtel. The canton was declared a republic, with a constitution similar to that of the other Swiss states. The king of Prussia protested, but in vain, against the change, and at length he withdrew all opposition, and remained satisfied with the bare title of prince of Neuchâtel, which he still retains.

SWITZERLAND, a co. in s.e. Indiana, adjoining Kentucky; bounded e. and s. by the Ohio river; about 250 sq. m.; pop. '80, 13,336—12,950 of American birth. The surface is hilly, except along the river. There are extensive forests. The soil is fertile. Corn, wheat, oats, grass, and live stock are the principal productions. Co. seat, Vevay.

SWIVEL is a gun constructed, as regards its carriage, to turn on a pivot, or on two concentric iron rails. Its use is on shipboard or in a fortress.

SWORD, a well-known weapon of war, the introduction of which dates beyond the ken of history. It may be defined as a blade of steel, having one or two edges, set in a hilt, and used with a motion of the whole arm. Damascus and Toledo blades have been brought to such perfection that the point can be made to touch the hilt and to fly back to its former position. In last century, every gentleman wore a sword; now the use of the weapon is almost confined to purposes of war. In the British army, all officers and sergeants, with troopers of cavalry, wear swords for cutting and thrusting. In the navy, all officers wear similar swords; and the men in time of action, heavy-backed swords, called *cutlasses*. In the French service, nearly all troops wear a combination of the sword with the bayonet, called a sword-bayonet.—For various sorts of swords and their uses, see **RAPIER**, **CUTLASS**, **BROADSWORD**, **SCIMITER**, **SABER**, etc.; **FENCING**.

SWORD FISH, *Xiphias*, a genus of fishes of the family *scomberida*, having the upper jaw remarkably elongated and compressed, in the form of a sword or dagger. The body is rather of a long shape, and covered with very small scales. There are no teeth. There is one long dorsal fin. There are no finlets. The ventral fins are wanting. The sides of the tail are very strongly keeled. The tail-fin is large and forked. Only one species is known, *X. gladius*, plentiful in the Mediterranean, and in the warmer parts of the Atlantic; sometimes, but rarely, seen on the British coasts. It is bluish black above, and silvery white on the belly, the one color passing gradually into the other. It is highly esteemed as an article for food, especially when young. It is harpooned by the fishermen of the Mediterranean, and is powerful enough to drag a boat along for many hours after being struck. It has been said to attack the whale with its sword, but this is extremely improbable. Its food consists in great part of squids and cuttle-fish. The use of the sword is unknown. Instances not unfrequently occur of ships' bottoms being perforated by the sword of the sword-fish, but there is no good reason to think that an intentional attack is ever made.—Other species of sword-fish, belonging to genera closely allied to *xiphias*, are found in the seas of different parts of the world.

SYBARIS, and **CROTON** or **CROTONA**, two celebrated Greek colonies in Magna Græcia (q.v.). The former—founded 720 B.C., by Achæans and Troezenians—was situated in the s. of the Lucanian territory, between the rivers Crathis (*Crati*) and Sybaris (*Coseila*) about 3 m. from the Tarentine gulf; and the latter—founded 710 B.C., by Achæans—about 50 m. s.e. on the coast of Bruttium. All that is certainly known concerning these cities before the destruction of the former is, that they both rapidly increased in size, wealth, and power, extending their dominions across the peninsula, and founding other colonies, at the same time preserving the most friendly terms with each other. Sybaris is said to have been 6 m. in circumference, and Croton 12 m.; the former being notorious for the excessive and fastidious luxury of its inhabitants (hence the term *Sybarite*), and the Crotoniates celebrated for the perfection they reached in athletic exercises—the famous athlete, Milo (q.v.), having been a native of Croton. Somewhere between 540 and 530 B.C., Pythagoras (q.v.) settled at Croton, and exercised very considerable influence over the aristocratic government. About 510 B.C., a democratic leader, Telys, deposed the oligarchy of Sybaris, banished 500 of the leading citizens, and assumed the tyranny of the city. The banished citizens having taken refuge in Croton, Telys demanded their surrender, and on being refused, declared war against that city. The Sybarites, with an army said to have amounted to 300,000, met 100,000 Crotoniates, commanded by Milo, at the river Traeis, were completely routed, and their city obliterated by the latter changing the course of the Crathis, so as to sweep it away. About 443 B.C., Thurii was founded near the site of Sybaris. After the destruction of Sybaris, Croton appears to have gradually declined, suffering much from internal convulsions (see **PYTHAGORAS**), as well as from the disasters which befell it in its wars with the Locrians, Rhegians (480 B.C.) and Bruttians, and also in those of Dionysius (q.v.) of Syracuse and Pyrrhus (q.v.). Its ruin was completed in the second Punic war; and although, in 194 B.C., it was colonized by Roman citizens, it never again rose to be a place of any importance. Croton, in the time of Herodotus, and at a later period, was famous as a medical school.

The modern town of Cotrone, standing very near the site of the ancient town, has a pop. of 6,878.

SYCAMINE, a tree mentioned in Scripture, and supposed to be the black mulberry (q.v.).

SYCAMORE, or SYCOMORE, *Sycomorus*, a genus of trees of the natural order *moraceæ*, regarded by many botanists as a mere sub-genus of *ficus* (see FIG), and differing from the true figs only in the elongated, straight, thickened, and club-shaped stigma. The species are chiefly African, but the geographical range extends also into the w. of Asia. Some of them attain a large size and a great age. The EGYPTIAN SYCAMORE (*S. antiquorum* or *ficus sycamorus*), supposed to be the sycamore of the Bible, is a large tree, very abundant in Egypt and in some parts of the w. of Asia, often planted near villages for the sake of its shade, its wide-spreading head sometimes covering a space 40 yards in diameter. The figs are top-shaped, and grow in clustered racemes on the trunk and oldest branches. They are sweet, well flavored, and somewhat aromatic. The wood is light, porous, and of little value. It has been supposed that the cases of Egyptian mummies are made of it, but this is disputed. Other species are found in Abyssinia, south Africa, etc.

The sycamore tree of Britain is a species of maple (q.v.). In some parts of North America, the same name is given to the plane (q.v.) of that country, *platanus occidentalis*.

SYDENHAM, a chapelry in the parish of Lewisham, county of Kent, with a station on the London and Croydon railway, 8 m. s. of London. It has become of world-wide celebrity in connection with the Crystal palace, which was erected here in 1854, chiefly from the materials of the building of the great exhibition (1851). The cost of the erection and appointment of the Crystal palace amounted to nearly £1,500,000. The building is 1600 ft. long, 380 wide, and at the center transept 200 ft. high. The chief arts and sciences illustrated by the collections within the palace and grounds are sculpture, architecture, painting and photography, mechanics and manufactures, botany, ethnology, paleontology, geology, and hydraulics. There are two concert-rooms, within the larger of which, performances have taken place at which there were 5,000 vocalists and instrumentalists. The park and gardens occupy nearly 200 acres, and are adorned with sculptures, stone balustrades, etc., and fountains which are perhaps the finest in the world.

SYDENHAM, THOMAS, a great English physician, was born of good parentage, in 1624, at Winford Eagle, Dorsetshire, and was educated at Magdalen hall, Oxford. According to the well-known French surgeon, Desault, he afterward studied at Montpellier. He graduated at Oxford as bachelor in medicine in 1648. Through the interest of a near relative, he obtained a fellowship of All Souls college, and there continued to prosecute his medical studies. He left the university without taking a doctor's degree, which, indeed, he did not obtain till some time afterward at Cambridge. He settled as a practitioner at Westminster, and practiced so successfully that, when only 36 years of age, he already enjoyed the reputation of being one of the first physicians of the period. In his later years he was much afflicted by gout, which at length carried him off on Dec. 29, 1689. He was buried in St. James's church. Sydenham was not profoundly accomplished as a man of science; even in his own age, deficient as it was in the advanced development to which the researches on which medicine is based have now attained, he was inferior to several of his contemporaries; but in sagacity of observation and accuracy of diagnosis, he was unsurpassed. His skill and his philosophic cast of mind secured him the admiration and friendship of Locke; and his contributions to the literature of his profession received the praise of Haller and Beerhaave. His writings have been often republished both in England and on the continent, the edition entitled *Opera Medica*, which appeared at Geneva in 1716, being the best. Fevers were the department of medicine on which he first bestowed his attention; and before he had been many years in practice, he published, in 1666, his celebrated treatise entitled *Methodus Curandi Febres Propriis Observationibus Superstructa*. This was afterward reprinted in 1675, with the observations accumulated in the interval. His treatment of the then destructive malady of small-pox was especially felicitous, substituting, as he did, for the stimulating regimen in vogue, the antiphlogistic method of cool air and salines. The most scholarly translation of his works into English is that of Dr. R. G. Latham, published in the Sydenham society's series, to which he gives its name.

SYDNEY, the capital of New South Wales, and the oldest city in Australia, is situated on the southern shores of Port Jackson, in lat. 32° 52' s., long. 151° 11' e. The first party of British settlers that reached New Holland were landed at Botany Bay on Jan. 20, 1788. The spot which they here selected being found ineligible, it was abandoned a few days afterward, and the infant settlement was transferred to a point about 7 m. further to the n., to the place where Sydney now stands. The choice of the new locality was chiefly determined by the circumstance of a stream of fresh water being found there, flowing into the deep inlet known as Sydney Cove, one of the numberless bays into which the basin of Port Jackson is divided. This last-mentioned magnificent expanse of water, completely land-locked, and admitting vessels of the largest size, extends for some 20 m. inland, ramifying in every direction. Its bold and rocky shores present a succession of picturesque and beautiful landscapes. The cliffs which form the general outline of the harbor often rise to a height of from 200 to 250 ft. In other points, the coast presents a lower level, consisting of a series of terraces and smooth

sandy beaches. Perhaps there are few positions on the habitable globe more obviously suitable for the foundation of a great metropolis. Situated at a distance of about 8 m. from the sea, the whole circumference of the bay round which it is built forms a series of natural wharves, where vessels of 2,000 tons burden can be moored within a distance of 20 yards. The narrow entrance of Port Jackson—through what is called the "Heads"—might easily be made inaccessible to any hostile fleet; whilst the central position of Sydney makes it necessarily the permanent emporium of the greater number of the British dependencies in the southern hemisphere. The immense coal formation of east Australia extends n. and s. for some 500 m., with a breadth of from 80 to 100 miles. Sydney stands nearly in the center of this great carboniferous basin; and at various points within a radius of from 30 to 100 miles, large quantities of coal are raised for colonial consumption as well as for export. The sandstone rock upon which the city is erected affords a valuable material for building.

Since the abolition of transportation, the growth of Sydney has been rapid, the pop. in 1862 amounting to 93,596, and in 1871 to 134,758, including the suburbs. For many years Sydney enjoyed a monopoly of the commerce of these antipodean regions. It has now formidable rivals in Melbourne, Adelaide, and the settlements of Queensland. It must, however, continue the exclusive outlet for the productions and commerce of extensive pastoral and mineral districts on the n.w., w. and south-west. The eastern shore of Darling harbor has its frontage entirely occupied with wharves and quays.

The streets in the older parts of the town are narrow and irregular; in the newer portions, care has been taken to avoid these defects; and several of the modern streets, from their breadth and the size and style of the buildings, are not behind those of the principal towns of Europe. The shops, warehouses, and private buildings in George and Pitt streets present long and compact lines of well-built stone edifices, often assuming a very ornate and ambitious style of architecture. The chief thoroughfares are paved, and lighted with gas, and a system of underground drainage has been carried out at a cost of nearly half a million sterling. There is also an abundant supply of pure water, the source of which is a natural reservoir known as the Botany swamps. There are numerous parks near the city. The botanical gardens, the finest in the colonies, cover 38 acres. Sydney has one ship-building establishment. The Fitzroy dry-dock, originally intended for vessels of the royal navy, can take in vessels of the largest size. Lately, steps have been taken to put the city in a state of defense, and forts and batteries armed with powerful Armstrong guns have been erected. The *climate* of Sydney is, upon the whole, temperate and healthy.

Among public buildings, by far the most important edifice, not only in Sydney, but in the whole of the Australian settlements, is the university, which stands on a commanding height, and in the center of a domain of about 150 acres. The principal facade is 500 ft. in length, and is flanked at its western end by the great hall, the proportions of which are such that, were it in England, it would rank as the third in point of size. Lectures are delivered daily during each term on classics, logic, history, chemistry, natural and experimental philosophy, and jurisprudence. The museum contains a collection of Greek, Roman, and Egyptian antiquities presented by the former chancellor, sir C. Nicholson. There are two suffragan colleges in connection with the university—that of St. Paul's, belonging to the church of England; and St. John's, erected under the auspices of the Roman Catholic community. The university, erected out of public funds, has a permanent endowment of £5,000 a year from the civil list; and each of the suffragan colleges receives aid toward its building fund, and the stipend of the warden and rector. Eighteen free scholarships, of the annual value of £50 each, are established in the university, in addition to several others that have been founded by private benefactors. The university is incorporated under an act of the colonial legislature and by royal charter. It is only empowered, however, to confer degrees in arts, law, and medicine; and, so far as the university is concerned, instruction is limited to purely secular teaching. The religious training of the pupils is left to the affiliated colleges. The metropolitan cathedral of St. Andrew is a handsome building in the later perpendicular style of architecture. Many of the churches, upward of 120 in number, belonging to different religious denominations, are tastefully designed. Among the buildings devoted to secular purposes, the most imposing and effective, in point of size and architectural design, are the residence of the governor, the museum, the exchange, the custom-house, the town-hall, the new post-office, and the public grammar-school. The neighborhood of Sydney, with every nook in the adjacent bays, is studded with elegant villas and snug cottages, surrounded by their park-like grounds, and gardens of orange-trees, bananas, and numberless semi-tropical plants unfamiliar to the English eye of the newly-arrived immigrant. There are numerous manufactories; one with 350 hands makes boots and shoes, and 32 make clothing, one steam joinery employs 250 hands. Sydney has three theaters, several mechanics' institutes, a large hospital for the sick, an orphan asylum, and other charitable and benevolent institutions, all liberally endowed and supported by public grants or private munificence. Public traffic is carried by about 600 omnibuses and hackney-carriages.

SYDNEY, a t. in e. Nova Scotia, co. seat of Cape-Breton co.; pop. about 3,000. It is 285 m. n.e. of Halifax, in the e. portion of the island of Cape Breton, and while it

was a colony was its capital. It has an excellent harbor and lighthouse. It contains extensive coal mines 3 m. from the village, and is connected by a railway with the Bridgeport mines, 15 m. distant. It is also connected by rail with Louisberg on the s. shore of the island. It contains 6 churches, a court-house, 3 branch banks, a masonic hall, 2 newspaper offices, and several hotels. The trade with Newfoundland is considerable; it has a regular line of steamers to Halifax, and there is constant communication between this port and the islands of St. Pierre and Miquelon. Cattle, coal, and dairy products are exported. Besides ship-building, its manufactures are leather, iron, boots, and shoes.

SYDNEY, ALGERNON. See SIDNEY (*ante*).

SYENE. See ASSOUAN.

SYENITE, a granitic rock found near the city of Syene, in Egypt. It is composed of quartz, feldspar, and hornblende, and differs from true granite in having the mica replaced by hornblende. The feldspar is generally red (sometimes it is found of a white color), and the hornblende gives a mottled red and dark green color to the rock.

SYKES, GEORGE, b. Del., 1822; graduated at West Point, 1842; commissioned in the infantry and served in the Seminole and Mexican wars, behaving with great gallantry at Cerro Gordo. He was afterward employed on the frontier, and in 1861 was in Texas with rank of captain. He was present at Bull Run, and in the Virginia campaign in command of regular troops, and also at Antietam, Fredericksburg, Chancellorsville, and Gettysburg; and was brevetted maj. general. In 1866 he was mustered out of the volunteer service, and is now a col. in the regular army.

SYKES, OLIVE (LOGAN), b. New York, 1841; at the age of 13 made her debut on the stage in Philadelphia; wife of Edmund A. Delille, 1857-65, went to Europe in 1857; was educated in England, and contributed to English and French papers. In 1864 she appeared at Wallack's theater, New York, in *Eveleen*, a play of her own composition; retired from the stage in 1868, and appeared on the platform as a lecturer on woman's rights, pursuing her former calling of newspaper correspondent and magazine writer. In 1876 she became the wife of Wirt Sykes, U.S. consul at Cardiff, Wales. She has published essays and lectures.

SYLLABUB, a culinary preparation, formerly much more used than at present. It consists of sugar and cream flavored with brandy, sherry, and lemon rind and juice, worked into a froth, and served up in that state in glasses.

SYLLABUS, a document published by pope Pius IX., 1864, condemning as heresies 80 doctrines which it calls "the principal errors of our times," dividing them into 10 sections; the 1st includes pantheism, naturalism, and absolute rationalism; the 2d, moderate rationalism; the 3d, indifferentism and latitudinarianism; the 4th, socialism, communism, secret societies, Bible societies, and other "pests of this description;" the 5th, errors concerning the church and her rights; the 6th, errors concerning civil society; the 7th, errors concerning natural and Christian ethics; the 8th, errors concerning Christian marriage; the 9th, errors concerning the temporal power of the pope; the 10th, errors of modern liberalism. Among the things thus denounced as errors are the principles of civil and religious liberty, and the separation of church and state. The document virtually declares that the pope is infallible; that Romanism has the exclusive right of being recognized by civil governments; that all other forms of religion are unlawful; that the papal hierarchy is independent of all civil authority, and that the Roman church has supreme control over education, literature, and science; with the right to enforce submission to its decrees. It reiterates all the papal claims of the middle ages, and declares war against modern social and national progress everywhere.

SYLLOGISM, a name expressing a principal branch or department of logic. When we reason, or get at truth by means of inference, we are said to proceed either inductively (see INDUCTION) or deductively. Deductive reasoning, when fully and methodically expressed, takes the form called the syllogism. "This thing will sink in water, for it is a stone," is a deductive argument, but not fully stated; the complete form is: "Stones sink in water; this is a stone; therefore, this will sink in water"—which form is called a syllogism.

To a perfect syllogism it is necessary that there should be three, and no more than three, *propositions* (see PROPOSITION); these are the conclusion, or the matter to be proved, and two others that are the means of proving it, called the premises. It is also necessary that there should be three, and no more than three, *terms*, namely, the subject and the predicate of the conclusion, and one, called the middle term, which must occur in both premises, being the connecting link for bringing the two other terms together in the conclusion. The *predicate* of the conclusion is called the major term, because it is in its scope the largest of the three; the *subject* of the conclusion is the minor term, as being the smallest in scope. The three terms enter into the premises in this manner: the major term and middle term make one premise, called the major premise; the middle term and the minor term make the minor premise. In the syllogism above stated, the terms are, "a thing that will sink in water" (major), "this thing" (minor), "stone" (middle); the premises are, "stones sink in water" (major), "this thing is a stone" (minor); the conclusion is, "this thing will sink in water."

The form now given, although the regular and fundamental form to prove any affirmative conclusion, is not the only form that an argument may assume. The totality of syllogistic forms is divided into *figures*, and each figure into *moods*, which are the distinct syllogistic forms, the principle of division being as follows: the figure is determined by the position of the middle term, which may be the *subject* of the major premise, and the *predicate* of the minor (1st figure), the *predicate* in both (2d figure), the *subject* in both (3d figure), the *predicate* of the major and the *subject* of the minor (4th figure).

The word "figure" is borrowed from rhetoric, where it means a departure from plain and ordinary speaking, as metaphor, hyperbole, etc. But, as remarked by Hamilton, only the last three of the foregoing enumeration should be called "figures." The first should be considered as embracing the regular forms of reasoning, and the others as properly figures—that is, forms more or less inverted, irregular, or unnatural, although still correctly representing reasonings that actually occur. These forms may be all *reduced* to forms in the 1st figure; their inversions or distortions being, as Hamilton would say, *redressed*, or restored to the primitive or fundamental type, namely, the syllogisms of the 1st figure.

The 4th figure did not belong to the original scheme of Aristotle, and it is usually considered as both unnatural and unnecessary, being only an awkward inversion of the first. There would then be the natural or standard syllogisms (the 1st fig.), and two sets of figurative departures from them (2d and 3d figs.).

The syllogisms of each figure are said to differ in *mood*, or according to the *quality* and the *quantity* of the propositions—that is, according as these are affirmative or negative (quality), universal or particular (quantity).

The entire scheme may be presented as follows: The symbols used are P (predicate of conclusion), major term; S (subject of conclusion), minor term; M, middle term. The general type of the first figure or standard is:

M is P.
S is M.
S is P.

When the quality and the quantity of the propositions are expressed, there arise four syllogisms of this form—two affirmative, and two negative:

All M are P.	} <i>Barbara, Darii.</i>
All (or some) S are M.	
All (or some) S are P.	
All matter gravitates.	
All (or some) air is matter.	
All (or some) air gravitates	
No M is P.	} <i>Celarent</i> and <i>Ferio.</i>
All (or some) S is M.	
No S is P; some S is not P.	

No matter is destructible.
All (or some) air is matter.
No air is destructible; some air is not destructible.

The general scheme of the 2d figure is:

P is M.
S is M.
S is P.

There are four syllogisms in all, which we may take in pairs thus:

No P is M.	} <i>Cesare</i> and <i>Festino.</i>
All (or some) S are M.	
No S is P; some S are not P.	

"No destructible thing is matter," etc., as in the last form.

All P is M.	} <i>Camestres</i> and <i>Baroko</i>
No S is M; some S is not M.	
No S is P; some S is not P.	

In this figure there is a certain distortion of the previous or regular figure. In the first of the two pairs, the major is, No P is M, instead of the equivalent (1st figure), No M is P. In the first form of the second pair, the minor is, No S is M, instead of the equivalent, No M is S, which should be the major to be regular; the amended premises would then give, in conclusion, No P is S, equal to No S is P.

All matter is extended.	} <i>Camestres.</i>
No mind is extended.	
No mind is matter.	

The last form, with a particular conclusion, is exemplified thus:

All matter is extended.
Some things are not extended.
Some things are not matter.

This is a form technically called *Baroko*, which is one of two that are especially difficult to reduce to the standard forms.

This figure proves only negatives.

The scheme of premises in the 3d figure is

M. P.

M. S.

Six varieties of syllogism come under this figure; we may arrange them in three pairs, the first two pairs having the same major, and the third the same minor:

All M is P.
All (or some) M is S. } *Darapti*
Some S is P. } and
 Datisi.

All planets move.

All (or some) planets are heavenly bodies.

Some heavenly bodies move.

No M is P.
All (or some) M is S.
Some S is not P.

} *Felapton*
and
} *Ferison*.

No solid body is perfectly transparent.

All solid bodies gravitate.

Some gravitating things are not perfectly transparent.

Some M is P; some M is not P. } *Disamis*
 All M is S. } and
 Some S is P; some S is not P. } *Bokardo*.

The first of the two is merely a standard syllogism (Darii), with transposed premises; the second (Bokardo) is more complicated, as in the example:

Some men are not fit to rule.

But all men are liable to have dominion.

Some men, liable to have dominion, are not fit to rule.

In the 4th figure,

P is M,
M is S.

there are five syllogisms. The mere forms are enough to quote:

All P are M. } *Bramantip.*
All M are S. }
Some S are P. }

All P are M.
No M is S.
No S is P. } *Camenes.*

Some P are M. }
All M are S. } *Dimaris.*
Some S are P. }

No P is M.
All M are S.
Some S are not P. } *Fesapo.*

No P is M. }
Some M are S. }
Some S are not P. }
 Fresison.

The reasons why these syllogisms are true, and why no other of 256 possible combinations of propositions can give true conclusions, are certain laws, called the rules of the syllogism, which repose on first principles of the highest certainty.

Mr. Mill has laid down the following fundamental axioms of the syllogism, as stated in its standard forms in the first figure. (1.) "Attributes coinciding with the same attribute, coincide with one another." M, the middle term, coincides with P, the predicate; S, the subject, coincides with M; therefore S and P coincide with one another. (2.) "Any attribute incompatible with a second attribute, is incompatible with whatever that second attribute coincides with." No M is P; M is incompatible with P; but S coincides with M, and therefore it also is incompatible with P.

All the syllogisms of the last three figures are reducible to the first, by conversion of

propositions and transposition of premises, according to the nature of the case. The symbolic name of each syllogism contains instruction for this process, as well as stating the composition of the syllogism. To aid the memory, these symbols are put together in five Latin hexameter verses of very ancient but unknown origin:

"Barbara, Celarent, Darii, Ferioque prioris.
Cesare, Camestres, Festino, Baroko, secundæ.
Tertia Darapti, Disamis, Datisi, Felapton,
Bokardo, Ferison habet, quarta insuper addit
Bramantip, Camenes, Dimaris, Fesapo, Fresison."

The first line gives the standard figure, and states the propositions entering into each syllogism. The three A's in Barbara are three universal propositions. The E, A, E, in Celarent, are a universal negative, a universal affirmative, a universal negative; in Darii, A, I, I, a universal affirmative and two particular affirmatives, etc. In the other figures the commencing letter (C, B, etc.) shows which standard syllogism each is to be reduced to (Baroko to Barbara, Cesare to Celarent, etc.). The consonant *s* means simple conversion of the proposition marked by the preceding vowel; *p* means conversion by limitation, or *per accidens*; *m* signifies the transposition of the premises; *k* occurs in Baroko and Bokardo, and denotes that these are to be reduced by supposing the conclusion false, and then showing that on that supposition Barbara would be contradicted—from which it is inferred that the original form is true.

There are some species of deductive arguments that do not fall under the syllogistic figures. Thus, the major may state a conditional proposition, and the minor affirm the truth of the condition. "If the witness is to be believed, the man is guilty" (major); now "the witness is to be believed" (minor); therefore "the man is guilty." A true conclusion would also be obtained by a minor denying the consequent, "the man is not guilty." It would then follow that the witness (who affirms his guilt) is not to be believed. But no conclusion would follow from either denying the condition, "the witness is not to be believed," or affirming the consequent, "the man is guilty;" for, in the first place, the man might be guilty whether this particular witness be credible or not; and secondly, the guilt of the man does not prove the credibility of the witness. This is called the *conditional syllogism*.

Again, the major may be what is called a disjunctive or alternative proposition, from which also inferences may be drawn by supplying certain minors. "This was done by either A or B;" now "it was not done by A (or by B);" therefore "it was done by B (or by A)." Should the major be understood to mean that it was done by one, and not by both, there would be two other possible inferences. "It was done by A (or by B);" therefore "it was not done by B (or by A)." There are other disjunctive pairs, as for example: "Either A is B, or C is D;" now "A is not B, therefore C is D," etc. This is called the *disjunctive syllogism*.

A combination of the conditional and the disjunctive makes the *dilemma*. For example:

If A exist, then either B or C exists.
Neither B nor C exists.
Therefore A does not exist.

The following dilemma was given to refute the practice of torturing witnesses: "A person able to endure pain will be likely to utter falsehood under torture; one unable will be equally likely; therefore, a person under torture will be likely to utter falsehood."

A very great enlargement has been given to the doctrine of the syllogism by sir W. Hamilton (see *QUANTIFICATION*), prof. De Morgan, and the late prof. Boole of Cork. They have shown that many more syllogistic pairs can be created, and have invented symbols for the purpose. It is, however, comparatively few, either of the old pairs or of the new, that are assumed by the ordinarily occurring arguments, either in the sciences or in common affairs. By far the most useful part of the syllogism is contained within the limits of the first or standard figure, which shows what premises are to be looked out for to prove any conclusion; namely, some *general assertion* of matter of fact, affirmative or negative (major), and a *particular assertion* that a given thing comes under the subject of the general assertion (minor), and therefore falls likewise under its predicate. When an argument is stated in a puzzling or perplexed form, with perhaps the omission of one of its essential propositions, it is well to know how to supply the suppressed premises, and put the argument into regular order: the truth or fallacy of the reasoning then becomes evident at a glance.

SYLPHS, in the fantastic system of the Paracelsists, are the elemental spirits of the air, who, like the other elemental spirits (q.v.), hold an intermediate place between immaterial and material beings. They eat, drink, speak, move about, beget children, and are subject to infirmities like men; but, on the other hand, they resemble spirits in being more nimble and swift in their motions, while their bodies are more diaphanous than those of the human race. They also surpass the latter in their knowledge, both of the present and the future, but have no soul; and when they die, nothing is left. In form they are ruder, taller, and stronger than men; but stand nearest to them of all the elemental spirits, in consequence of which they occasionally hold intercourse with human creatures, being especially fond of children, and of simple harmless people; they even

marry with our race, like the undines and the gnomes, and the children of such a union have souls, and belong to the human race.

In common usage, the term sylph has a feminine signification, and is applied to a graceful maiden. How this curious change of meaning occurred is not quite certain; but it is probably owing to the popularity of Pope's *Rape of the Lock*, which introduced the term into the world of fashion and literature. For although even in Pope, the sylph that guards Belinda is a *he*, yet the poet so refined and etherealized his spiritual agents, that they soon came to be associated with all our ideas of feminine grace and beauty, and this circumstance may have reacted on the popular idea—always loose and inaccurate—of their character and sex, and brought about the change of gender to which we have alluded. See Paracelsus's *Liber de Nymphis, Sylphis, Pygmæis et Salamandris et Cæteris Spiritibus* (Basel ed. of Paracelsus's works, 1590).

SYLVESTER, the name of two popes, and of a third who was an anti-pope. The pontificate of the first immediately succeeded that of Melchisedes in 314, and is memorable for the great council of Nicæa, in which the heresy of Arius was condemned. Sylvester himself did not attend the council, but sent two priests—Vitus and Vicentius—to take his place. His name is also celebrated in connection with the so-called donation of Constantine to the Roman church, the spuriousness of which (although no doubt had been raised regarding it during many centuries) has long been admitted by critics. He died in 335. Sylvester II., one of the most learned of the mediæval popes, originally called Gerbert, was b. at Aurillac, in Auvergne, early in the 10th century. He was educated in the monastery of his native village; but went early to Spain, where he learned mathematics, and afterward to Rome. He was appointed abbot of the monastery of Bobbio, where he taught with much distinction and success. At a later period he went to Germany as preceptor of the young prince Otho, afterward Otho II.; and ultimately became secretary to the archbishop of Rheims, and director of the cathedral school, which became eminent under his care. The archbishop having been deposed, Sylvester was elected to the archbishopric; but he was afterward set aside, the deposition of his predecessor having been declared invalid. In the year 998, however, he was appointed archbishop of Ravenna, whence he was called to the pontifical throne, in the following year, under the name of Sylvester II. He was a man of rare acquirements for his age. He was an adept in mathematics, and in practical mechanics and astronomy, in which department his attainments acquired for him among his contemporaries the evil reputation of a magician. He is also believed to have been acquainted with Greek, and perhaps with Arabic. Of all his works, which were numerous, his letters (printed by Du Chesne in the *Historians of France*) have attracted most notice from their bearing on the history of an obscure period.

SYLVESTER, JAMES JOSEPH, b. London, 1814; educated at Cambridge university. He became a distinguished mathematician, and has been professor at the university of Virginia, University college, London, the Woolwich academy, and the Johns Hopkins university, Baltimore, Md., with which he is now connected. He has written several treatises on mathematical subjects, is the inventor of the "modified pantograph," and has made most important investigations in modern algebra.

SYLVESTER, JOSHUA, b. England, 1563. His life was divided between the somewhat incongruous pursuits of merchandise and poetry, in neither of which did he achieve a distinct success. Of his original works, the human memory retains no trace; but in virtue of the great, though fleeting popularity obtained by his English version of the *Divine Weeks and Works of Du Bartas*, from which Milton is thought to have derived some hints, he lives in literary history as a sort of *nominis umbra*. He led a somewhat wandering life, and died at Middleburg, in Holland, in the year 1618.

SYLVIADÆ, a family of birds, of the order *insessores*, and tribe *dentirostres*, including a very great number of small species, among which are many of the birds most noted for sweetness of song, while some of this power is possessed by almost all the family, so so that the name *warblers* is often used as synonymous with *sylviadæ*. The bill is sharp, slender, straight, and rather compressed toward the tip; the wings moderately long; the legs slender. To this family belong the nightingale, the blackcap, numerous species known by the name of warbler, the redbreast, redstart, wheatear, whitethroat, stonechat, whinchat, golden-crested wren, hedge-sparrow, etc. The sylviadæ are diffused over all parts of the globe; and some of those found in tropical countries possess considerable musical powers, but are generally as silent during the great heat of the day as during the darkness of night, and are chiefly to be heard early in the morning.

SYMBOLIC BOOKS, in the language of the church, is a phrase that signifies the same as creeds and confessions (q.v.). The name is derived from the Greek *symbolon*, a sign or mark by which anything is known—a creed being the distinctive mark or watchword of a religious community.

SYME, JAMES, was born in 1799, in the county of Fife, and received a thorough education in art and medicine, in the university of Edinburgh. In his 19th year he began his anatomical studies under Liston, who appointed him his demonstrator. From 1825 to 1832, he lectured on surgery in the Edinburgh school, and, while generously refusing to lecture in opposition to his old master in the Edinburgh infirmary, he established a hos-

pital at his own expense, where he delivered a clinical course for four years. In 1831, appeared his well-known treatise on *The Excision of Diseased Joints*; and in 1832, his *Principles of Surgery*, which has since gone through many editions, and which has established his reputation as a teacher of the first rank. In 1833, he was elected to the chair of surgery in the university of Edinburgh, which he filled with the highest distinction. In 1847, he gave up his Edinburgh chair to fill that vacated in London by the death of Liston; but collegiate misunderstandings induced him, after six months, to return to Edinburgh. As an operator, Mr. Syme had no superior; as a teacher, he had no equal. His innovations in the practice of his art were characterized by so much ingenuity, controlled by scientific caution, that they were adopted by all really great surgeons. The best of his pupils, who are numerous, and scattered over every quarter of the globe, have been heard to declare that their soundest ideas in surgery are derived from Syme. Beside the works already named, he was the author of valuable treatises on diseases of the rectum; on the pathology and practice of surgery; on the urethra and *fistula in perineo*; on incised wounds, etc. He died June 26, 1870. See the *Memoir* by Dr. Paterson (1874).

SYM'MACHIUS, CÆLIUS, Pope, about 440-514; b. Sardinia; entered the priesthood, rose through the steps of sacerdotal rank, and in 498 was chosen as the successor of Anastasius II. But Laurentius, the favorite candidate of Festus, Anastasius I. and the Eutychians, had a strong following. As arbitrator Theodore I. of Italy favored Symmachus; but in 499 Laurentius returning to Rome, accused the pope *de facto* of bribery, and a contest, marked by violence and bloodshed, ensued. The council of 502 acquitted the pope of the charges of bribery and Maucheism. Symmachus was canonized after his death.

SYMMACHUS, Q. AURELIUS, a distinguished Roman orator, scholar, and statesman who flourished toward the close of the 4th c., was educated in Gaul, and after holding several lesser offices, became prefect of Rome (384 A.D.). Seven years later he was raised to the consulship. The date of his death is unknown, but we know that he was alive in 404 A.D. The character of Symmachus is a very fine one. A sincere pagan in an age when classic paganism was almost extinct, he proved in his own person a pattern of its choicest virtues, and manfully, if in vain, strove to regain for it a place of honor in the state. Symmachus's extant writings consist of ten books of letters (*Epistolarum Libri X*) and the fragments of nine orations. The former were published after his death by his son, and contain not a little that is valuable in relation to the history of the period; but the style is in general a slavish imitation of Livy. The best editions of the epistles are those of Juretus (Par. 1604) and Scioppius (Mainz, 1603). The fragments of the orations were first discovered by cardinal Mai in a palimpsest of the Ambrosian library, and were first published at Milan in 1815; afterward, with some additions, at Rome in 1823, in *Scriptorum Veterum Nova Collectio*. See Morin's *Etude sur la Vie et les Ecrits de Symmaque*, *Préfet de Rome* (Par. 1847).

SYMMES, JOHN CLEVES, 1742-1814, b. Long Island; founder of the Miami settlements; member of congress, 1785-86; judge of the supreme court of New Jersey; chief justice of the north-west territory, 1788. He married a daughter of gov. William Livingston. His daughter became the wife of president Harrison.

SYMMES, JOHN CLEVES, 1780-1829, b. N. J.; in 1802 he became an ensign in the U. S. army, and served with credit in the war of 1812. After the close of the war he became a resident of Newport, Ky., and spent his time in studying, writing, and lecturing on scientific and geographical subjects. He acquired some notoriety by his extraordinary theory that there is an opening at each of the poles, leading into the center of the earth, which he thought was hollow, and capable of habitation. He wrote *Theory of Concentric Spheres* (1826).

SYMMETRY OF ORGANS. Throughout the animal kingdom, a symmetry of organs very generally prevails in the two sides of the body. This is the case in man and in all the *vertebrata*; more perfectly, however, in the external than in the internal organs, the two sides of the body presenting great diversities in the circulating, digestive, and other systems. Even the external organs, although similar on the two sides, are never perfectly so. On comparing the two hands, for example, the veins of the one will be seen to differ from those of the other. In *mollusca*, the symmetry of the two sides sometimes exists, and is sometimes entirely lost, the one side remaining undeveloped in the growth of the animal. In the *articulata*, the symmetry is in general as perfect as in the *vertebrata*, and in the internal structure even more so. In the *radiata*, the whole type is very different, and a very different kind of symmetry appears, not with reference to two sides, but to the rays into which the body divides.

In the vegetable kingdom, a symmetry is found, more or less perfect, but never completely so, between the two sides of leaves, fronds, etc. In flowers, a symmetry appears in the regular distribution of sepals, petals, stamens, etc., around the center of the flower; and even those flowers which least exhibit it when fully blown, as papilionaceous flowers, possess it in the early stages of the bud as perfectly as others.

SYMONDS, JOHN ADDINGTON, 1807-71, b. England; educated at the university of Edinburgh, where he took a medical degree. He was physician to the Bristol general

hospital, and lecturer at the Bristol medical school. He published *Sleep and Dreams* (1851); the *Principles of Beauty* (1857), and *Miscellanies* (1871).

SYMPATHETIC INK. See **INK.**

SYMPATHY (Gr. *sympátheia*, fellow-feeling) may be defined as the assumption by different individuals, or by different parts of the same individual, of the same or an analogous physiological or pathological state at the same time or in rapid succession. The late Dr. Todd (art. "sympathy" in the *Cyclopædia of Anatomy and Physiology*) divides all the examples of sympathy which are included in the above definition into three classes; first, sympathies between different individuals; secondly, those which affect the mind, and, through it, the body; and, thirdly, those which are strictly organic, and therefore physical.

As examples of the *first class* may be mentioned the readiness with which the act of yawning is induced in a company, if a single person begins to yawn; the facility with which hysterical convulsions are induced in a female hospital ward by a single case; the fascination of its prey by the serpent, apparently by the power of the eyes; the similar power exerted by so-called electro-biologists and mesmerists, and by which some men can control even the fiercest carnivora. Of these sympathies the only explanation that can be given is that suggested in the article on Animal Magnetism (q.v.). As examples of the *second class*, the following cases may be adduced: certain odors—as of strawberries, mutton, cats, and other most diverse objects—will induce fainting in some people; the smell of a savory dish will excite a flow of saliva in the mouth of a hungry person; and the excitement of the emotions of pity will produce a copious flow of tears. In these cases, an affection of the mind is a necessary link, but why that affection of the mind should produce its peculiar effect, is a question not easily answered; but it is plain that the portion of the nervous center which is affected in such cases, must have a direct influence upon the parts in which the sympathetic phenomena appear, through commissural (or connecting) fibers, or the continuity of its gray matter with that of the center from which its nerves immediately spring. Examples of the *third class* occur in the pain in the knee which arises from disease of the hip-joint; the pain in the right shoulder from disease of the liver; the pain over the brow on taking a draught of iced water into the stomach; the various spasmodic affections connected with intestinal irritation, or the irritation of teething; the vomiting that occurs on the passage of a biliary or renal calculus, etc. All these cases may be more or less satisfactorily explained by the known laws of the sensory and motor nerves. In some of these cases the explanation, however, cannot be regarded as altogether complete. For example, the pain over the brow from the ingestion of cold water or ice into the stomach, may be referred to irritation of the gastric branches of the pneumogastric nerves communicated in the medulla oblongata to the fifth nerve; but why the irritation should be confined to the frontal branch of the first (or ophthalmic) division of the fifth nerve, we are utterly unable to explain.

SYMPHONY, in music, a word used in two different senses: 1. The instrumental introduction and termination of a vocal composition, sometimes called *ritornello*; 2. A composition for a full orchestra, consisting of from three to six movements. It is for the orchestra what a sonata (q.v.) is for a single instrument; but generally of greater length, and its movements more fully and richly developed, the subjects introduced being worked out in broader masses. The most usual though not unvarying order of movements is a brilliant allegro, ushered in by a slow introduction, an adagio or andante, a minuet with its trio, a short sportive movement called a scherzo, and a lively finale. The symphony is one of the highest of musical compositions, and one in which excellence is rare. Haydn, Mozart, Beethoven, and Mendelssohn are among the few successful composers of symphony; and the nine symphonies of Beethoven are generally acknowledged to be the greatest works of their class. The overture (q.v.) is in form not unlike a symphony, but much shorter; but the terms symphony and overture were at one time used almost synonymously, and several of Haydn's early symphonies are called overtures. At the present day the overture in the composer's score of an Italian opera is called *sinfonia*.

SYMPHYTUM. See **COMFRET.**

SYMPTOMS (Gr. *sympiptein*, to concur), in medicine, are the morbid phenomena by which the physician becomes aware that derangements of some kind have taken place in the economy; but it requires a mental effort to convert these symptoms into signs of disease. A symptom thus converted into a sign of some special disease or disordered condition, tends to constitute the *diagnosis*, or recognition of the disease. "The interpretation of symptoms," as Dr. Aitken observes, "can only be successful after a close observation of the patient—often prolonged and repeated for more complete investigation—so as to connect the results arrived at with his previous history. The utmost logical acumen is required for the due interpretation of symptoms. The individual value of each ought to be duly weighed; one symptom must be compared with another, and each with all, while the liability to variation of a similar symptom in different cases of a like kind must not be forgotten. Thus only can the nature of a disease be clearly determined, its severity and dangers fully appreciated, its treatment indicated, and the probability of recovery foretold."—*The Science and Practice of Medicine*, 3d ed. vol. i. p. 9. Many

writers, following the example of Laennec, confine the term *symptom* to the phenomena depending on vital properties; while those phenomena of disease which are more directly physical, they call *signs*. We thus have what may be called *physical signs* and *vital symptoms*. The form, size, color, firmness or softness, heat and odor of a part of the body, the sounds which it yields on percussion or discultation, etc., afford *physical signs*; while *vital symptoms* may be exemplified in pain, uneasiness, altered or impaired sensations, spasm, vomiting, the accelerated pulse and hot skin of fever, the state of the tongue and of the alvine and urinary excretions, etc. The term *semeiology* (literally, *the theory of signs*) has been given by medical writers to the general study of this subject, which is admirably discussed in Williams's *Principles of Medicine*.

SYNAGOGUE (Gr. = *ecclesia*; Heb. *beth-hakkeneseth*, house of assembly), a Jewish place of worship. The origin of this institution is probably to be traced to the period of the Babylonian captivity, although tradition finds it in the patriarchal times. When, at the time of Ezra, and chiefly through Ezra's instrumentality, the ancient order of things was re-established in Judea, synagogues were established in all the towns for the benefit of those who could not take part oftener than three times a year, or not even as often as that, in the worship of the temple at Jerusalem, and a special ritual of lectures and prayers was instituted. From the time of the Maccabees, we find them even in all the villages; and Josephus, Philo, the New Testament, the Mishna, and the Talmud, constantly allude to them. Common prayer and religious instruction were the purpose for which the people there met. The Sabbaths and feast-days were the principal times on which the faithful assembled in them; and they contributed more than anything else to the steadfast adherence of the people to their religion and liberty as long as there was any possibility of keeping both intact. At the same time they gradually undermined the priestly and aristocratic element that gathered round the temple, its gorgeous worship and kingly revenues. Little is known of any special laws respecting the construction of these buildings, save that the faces of the worshippers should be directed toward Jerusalem (*mizrach* = eastward) (see *Mosque*); or that, in accordance with the verse in the Psalms, there should be a slight descent of a step or two on entering it, or that it should stand, if feasible, on a slightly elevated ground, or be somehow or other made visible far off. Erected out of the common funds or free gifts of the community, it had also to be supported by taxes and donations. All profane doings were strictly prohibited in it. No eating, drinking, reckoning, and the like, were allowed; and even as to dress and other things of general decorum, the reverence due to the place was enforced as rigidly as possible. It represented in miniature the form of the temple, itself an enlarged type of the tabernacle. At the extreme eastern end was the *Aron hakkodesh*, the holy ark, containing several copies of the Pentateuch, from which the periodical readings were chanted. In front of this was the stand of the public reader of the prayers, not far from which was suspended the everlasting lamp (*ner tamid*). On a raised platform in the middle of the synagogue, was the place of the reader or preacher. The women sat separated from the men by a low partition five or six ft. high. The affairs of the synagogue were administered by a board of "ancients" or "elders," at whose head stood a chief or principal (*Rosh hakkeneseth* = *archisynagogos*). This college managed the inner affairs of the synagogue, and had even the power of excommunication. The officiating minister, whose office it was to recite the prayers aloud, was called *sheliach tzibbur*—messenger of the community (*angelos ecclesiae*, Rev.). His qualifications were, among others, to be active, to be father of a family, not to be rich or engaged in business, to possess a good voice, to be apt to teach, etc. The beadle, or *chazzan*, had the general charge of the sacred place, and its books and implements. He had to present the scroll to the reader, and assist on other occasions. During the week-days, he had to teach the children of the town or village. He too had to be initiated by a solemn imposition of hands. This name of *chazzan*, however, at a later period, came to designate the officiating minister, and it has retained that meaning until this day. Almoners or deacons, who collected or distributed the alms, possibly the same as the *ballanin* or "idle men," whose office in relation to the synagogue cannot be exactly determined now, but who had always to be ready for the purpose of making up the requisite number of ten worshippers, were further attached to the general body of officials. Respecting the prayers used, we have spoken under **LITURGY (JEWISH)**. As to the time of daily worship, we may observe that the third, sixth, and ninth hours of the day were the times appointed for it, and the more special days were the Monday and Thursday, when the judges sat, and the villagers came to town; and the Saturday, on which the forms of some of the prayers were altered according to the occasion.

On the connection between the Jewish synagogue and the Christian church, and their respective rites and modes of worship we cannot here enlarge. Thus much, however, we may say, that it is obvious to the most superficial observation that the principal practices of the latter belong, with certain modifications, to the former; and it has been conjectured that even the melodies of certain hymns still sung in the Roman churches are to be traced to the temple and the synagogues. It is, moreover, well known that the early Christian churches were entirely organized after the pattern of the synagogues. As to the judicial power exercised by the officers of the synagogue, we refer to **SANHEDRIM**. They had, there can hardly be a doubt, a kind of authority with

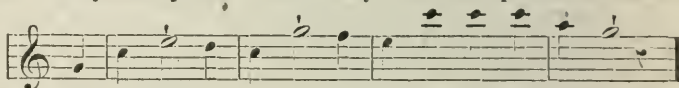
regard to religious transgressions; but how far they were allowed to carry this authority, is not so easily determined. Modern synagogues differ but in some minor points—additional prayers and the like—from what we gather to have been the nature of those at the time of Christ, save that there are no more elders, but a simple board elected from the community, without any authority beyond that of, perhaps, a board of church wardens, and that the chazzan, as we said, has now the functions of the “sheliach.” See JEWS, TEMPLE, LITURGY (JEWISH) etc. The languages used in the early synagogues of Palestine and Alexandria, were Hebrew, Aramaic, and Greek respectively.

SYNAGOGUE, THE GREAT (*keneceh haggedolah*), an assembly or synod, supposed to have been founded and presided over by Ezra, consisting of 120 men, said to have been engaged in remodeling the national and religious institutions of the Jews after the return from Babylon. The palpable chronological discrepancies that occur in the early accounts about this synod, together with other doubtful points, have led modern scholars to deny its existence completely. But the fact of Josephus not mentioning it avails very little against the positive assertions of the Talmud, and what is still more important, of the Karaites, the professed adversaries of all tradition. True, Ezra, the contemporary of Artaxerxes, can never have taken his place in it together with Zerubbabel and Joshua, who left Babylon under Cyrus, or with Simeon the Just, who lived at the time of Alexander the Great. These, however, are but apparent anachronisms. The tradition never meant anything else than that the institution founded by Ezra, and which lasted up to the time of Alexander, comprised 120 men, of whom Simeon was one of the last. Anyhow, there is absolutely no reason to doubt that Ezra and Nehemiah did a certain amount of work which they could not have done without being assisted by eminent collaborators. It was to this body to which certain vital ameliorations in the administration of justice are ascribed. They developed public instruction, and fixed and enlarged the Mosaic laws by certain rules of interpretation. “Be circumspect in judgment; make many disciples; and erect a fence around the law;” are some of the principal sayings ascribed to them. Above all, it seems to have been the office of Ezra and his coadjutors—the men of the Great Synagogue—to collect, purify, and redact the sacred books as much as in them lay. Whether, however, they really introduced the vowel-points, which have been handed down to us by the Masoretes, instituted the Feast of Purim, sanctioned the Eighteen Benedictions (see LITURGY, JEWISH), etc., is more than doubtful. They certainly disappeared before the Sanhedrim (q.v.) were instituted, but it may be that their legislative functions were no longer needed at that advanced period.

SYNANTHERÆ. See COMPOSITÆ.

SYNCLINAL AXIS is the line of curve in the trough of a series of beds from which the strata rise on either side. The ridge-curve is called the anticlinal axis.

SYNCOPE, in music. Notes which begin on the unaccented part of a measure, and end on the accented, are called syncope or driving notes. Their effect is to invert the rhythm, and lay an emphasis on the usually unaccented part of the measure, e.g.:



SYNCOPE. See FAINTING.

SYNCRETISM (signifying acting together as Cretans), a term used: I. In ancient times, *politically*, to designate the Cretan custom of disregarding all internal dissensions whenever a controversy with a foreign country occurred. II. In the 16th c., *philosophically*, to denote the efforts made to reconcile opposing systems. III. In the 17th c., *theologically*, first by Pereus in his *Irenicon*, and afterward to describe the views of Calixtus and his followers, who sought to heal the schism in the church by making the traditions of the first five centuries of equal authority with the Bible, and by adopting the Apostles' creed as the common basis of all Christian denominations and a sufficient definition of true Christianity. The plan was that all holding these tenets should come into peaceful relations.

SYNDIC (Gr. *syn*, with, and *dikê*, justice), a name which has at different times and in different countries been given to various municipal and other officers. In Geneva the chief magistrate was formerly called the syndic. The syndics of cities in France, under the old régime, were officers delegated by the municipality as agents or mandataries; the various trading companies in Paris and the university had also their syndics; and in the university of Cambridge the same name is applied to members of special committees of members of the senate, appointed by grace from time to time for specific duties. See UNIVERSITY.

SYNECDOCHE (Gr. literally an “understanding one thing with another”) is a term in rhetoric denoting that mode of expression by which a part is put for the whole, and *vice versa*; as e.g., a door for a house, a sword for any weapon of war.

SYNERGISM (Gr. *synergeo*, to work together with), the name given to a doctrine of theology which teaches that in the work of conversion, the will of man is not wholly

passive, but can co-operate, through consent, with the Divine Spirit. About 1557 the question was hotly discussed by the Protestant theologians Pfefinger, Flacius, and Strigel, and soon the whole theological world was wrangling over the point. The Wittenberg divines were in favor of, the Mansfeld divines against, synergism. Finally, the *Concordien formul*, in its third article, condemned it.

SYNE'SIUS, b. Cyrene, Africa, about 379, from a rich and noble family; was a philosopher, poet, and Christian bishop. He was a pupil of the renowned Hypatit of Alexandria, afterward studied at Athens, and, returning to Cyrene, lived in retirement. He was sent to Constantinople to solicit aid for the people suffering from famine, and, soon after his return to Cyrene, was converted from paganism by the influence of his Christian wife. In 410, though not baptized, and married, and holding certain doctrines not considered orthodox, he was made bishop of Ptolemais. After baptism and seven months' preparation he entered upon his duties. His works, mostly epistles, treatises and hymns, were collected by Petavius in Greek, with a Latin translation, and published in 1612 and 1640. The hymns have often been published, in several languages. He is supposed to have died about 430.

SYNGE'NESIA. See COMPOSITE.

SYNGNA'THIDÆ. See PIPE-FISH.

SYNOD (Gr. and Lat., an assembly) in general signifies a meeting, but it is almost exclusively applied to ecclesiastical assemblies for the purpose of deliberating on doctrinal or disciplinary subjects. In church law, several kinds of synods—called also councils (q.v.)—are enumerated: (1) ecumenical or general, of the entire church; (2) national—that is, of the church of an entire nation; (3) provincial—that is, of a province; (4) diocesan, or of a single diocese. Of these, the ecumenical council has been already described. Of the others, little explanation is needed beyond what is conveyed in the names themselves. By the law of the Roman Catholic church, the decrees of a national or provincial synod must be submitted to the pope, and unless confirmed by him, or at least suffered to pass for two years without condemnation, are not held to have force. The diocesan synod is convened by the bishop, and consists of the members of the chapter, the benefited clergy having the permanent care of souls, and the heads of the communities of regular clergy. Synods of the English church are only held by the authority of the crown. A Presbyterian synod consists of only the ministers and elders within the particular district, generally one elder for each congregation. It is subordinate, however, to the general assembly, when there is a general assembly.

SYNO'DIC, the epithet applied to the period which elapses between a planet's appearance at one of the nodes of its orbit, and its return to the same node. See NODES and MONTH.

SYNONYM. When any one of several words will serve to name or express the same thing, that thing is said to be *polyonymous*, or many-named, and the words are called *synonyms* (Gr. names together, or in company). In this wide sense, *man*, *soldier*, *general*, *Frenchman*, might be called synonyms, as they can all be applied to denote the same individual—e.g., Napoleon. See NOTION. But the term is commonly applied in a restricted sense to words having substantially the same meaning, with only slight shades of difference—as *observe* and *remark*. In a settled and matured language, no two words can have exactly the same meaning; in such a case, one of them would be superfluous, and would be silently dropped. Words that were originally identical in application, have become differentiated by usage, each being appropriated to a special variety of the general notion.

The English language abounds in pairs of synonyms like *sharp* and *acute*, of which the one is Anglo-Saxon, the other borrowed from the Latin. It would be difficult to find a case of more exact correspondence of sense than *acutus* in Latin, and *sharp* (Ger. *scharf*) in Teutonic; but *acute* in English has become confined to the metaphorical sense of sharpness of the intellect or of the senses, the only case of its retaining the primary, physical signification being in the technical phrase, an "acute angle." *Sharp*, again, is applied both in the physical sense and also in the metaphorical; but metaphorical *sharpness* is not exactly the same thing as *acuteness*. A "sharp" lad is one quick in apprehension and movement; an "acute" intellect is one having great power of penetration and discrimination; while in a lawyer of "sharp" practice, a reprehensible moral quality is implied.

SYNOVIAL MEMBRANES AND FLUID. In every joint in which a considerable range of motion is required, the osseous segments (or contiguous extremities of bones) are separated by a space, which is called the cavity of the joint. The end of each of the bones entering into the composition of the joint is incrustated by a layer of articular cartilage adapted to its form, and the entire cavity of the joint is lined by a delicate membrane, which is termed the *synovial membrane*, which secretes a peculiar viscid matter, termed *synovia*, or *synovial fluid*, for the purpose of lubricating the inner surface. In its microscopical characters, a synovial membrane so closely resembles a serous membrane, that we shall content ourselves with referring the reader to the article on the latter structures. There are, however, certain points of difference, which are fully described in the article "Serous and Synovial Membranes" in *The Cyclopædia of Anatomy and Physiology*. Like

a serous membrane, a synovial membrane is always a closed bag, like the pleurae, for example, with an attached and a free surface, the latter being smooth and moist. A very simple form of synovial membrane—anatomically known as a *bursa*—is employed to facilitate the gliding of a tendon of a muscle or of the integument over a projection of bone. It consists of a bag connected by areolar tissue with the neighboring parts, and secreting a fluid in its interior. These bags are sometimes prolonged into *synovial sheaths*, which surround long tendons, such as those of the flexor and extensor muscles of the fingers and toes. In deep-seated whitlow (q.v.), when inflammation extends to one of the sheaths, and gives rise to the formation of adhesions, the motion of the inclosed tendon is destroyed, and a permanently stiff finger is the result.

The *synovial fluid*, or *synovia* derives its name from its resemblance to the white of an egg (Gr. *syn*, with, and *ōn*, an egg). It consists of water holding in solution mucin, albumen, extractive matters, fat, and inorganic salts. The analysis of Frerichs shows that the composition and quality of the synovia vary essentially according as an animal is at rest or leads a wandering life.

SYNTAX (Gr. *taxis*, arrangement, *syn*, together) is the part of grammar that teaches the putting together of words for the expressing of thoughts; in other words, it treats of the construction of sentences. The first step is the analysis of sentences—the study of their anatomy and physiology, as it were (see SENTENCE). This important part of the subject is too often altogether overlooked. A clear perception of the mutual relations of the several members of a sentence makes the usual rules of syntax appear self-evident truths, and in most cases superfluous. Most of these rules fall under the heads of (1) concord and government, and (2) order of words or collocation. For details we must refer to special works on the subject.

SYNTHESIS (Gr. *synthēsis*, making a whole out of parts) is a term employed in chemistry to designate the building up of a more or less complicated product from its elementary constituents. As the synthesis of inorganic compounds is usually very simple, we shall confine our remarks to organic compounds. To take a very common substance as an illustration, there is no difficulty in resolving sugar into its ultimate elements, or, in other words, in ascertaining its composition by analysis. If we heat a little sugar to redness in a glass tube, it leaves a black deposit, which is carbon, while a liquid, which is water, distils over; and, on electrolyzing this liquid, we resolve it into hydrogen and oxygen; so that we can thus show that sugar is composed of the ultimate elements, carbon, hydrogen, and oxygen. An analysis of this kind shows that sugar may be represented by the formula $C_{12}H_{22}O_{11}$, and that one atom, or any given weight of it, contains 72 atoms or parts by weight of carbon, 11 of hydrogen, and 88 of oxygen. This pulling to pieces of the sugar is an easy matter, and has been known to chemists for more than half a century; but the putting together of the pieces, or, in other words, the synthesis of sugar, is a very much more difficult task. We may bring together carbon, hydrogen, and oxygen in the due proportions, and, to use the words of prof. Wanklyn (in a lecture delivered at the Royal Institution, Feb. 12, 1864), "we may shake them all together, or heat them, or cool them, and yet we shall never get them to combine so as to form sugar. Alcohol consists of 24 parts of carbon, 6 parts of hydrogen, and 16 parts of oxygen; but no alcohol ever results from making such a mixture. Neither sugar nor alcohol can exist at the temperature to which it is requisite to raise our mixture of carbon, hydrogen, and oxygen, in order to get chemical action to set in. At ordinary temperatures, the organic elements will not enter into combination, while at high temperatures they combine, it is true, but yield comparatively very few compounds." There was a general belief that organic products, such as sugar, alcohol, urea, oxalic acid, taurine, leucine, etc., required for their production a mysterious so-called *vital force*, totally distinct from the ordinary forces acting on matter. The first blow to this now obsolete doctrine was struck by Wöhler in 1828, when he discovered that the organic base *urea* might be artificially obtained. See ORGANIC COMPOUNDS. Three years afterward Pelouze obtained *formic acid* from inorganic materials. In 1845 Kolbe, by a somewhat complicated process, effected the synthesis of *acetic acid*, and consequently, indirectly, of its derivatives, among which may be enumerated *acetone*, the product of the destructive distillation of acetates; *marsh gas*, obtained by distilling an acetate with a caustic alkali, and *ethylene*; and the electrolysis of acetic acid, which Kolbe accomplished a few years afterward, yielded methyl and oxide of methyl, which latter could be transformed into any other methylic compound. During the last twelve years new and simpler methods have been suggested by various chemists, among whom Berthelot must be especially mentioned, and enormous additions have been made to the list of so-called organic compounds which have been synthetically constructed. We shall give a description of the mode of producing alcohol synthetically, and shall then show that from it, as a starting-point, an immense number of other organic compounds can be synthetically produced. To obtain this product synthetically, several distinct steps are necessary. The first is the formation of a transparent colorless gas, acetylene, C_2H_2 , from carbon and hydrogen in the electric arc; by passing this gas through sub-chloride of copper, acetylide of copper is produced, which, in contact with nascent hydrogen, gives olefant gas, C_2H_4 ; agitated with sulphuric acid, olefant gas produces sulphovinic acid, $C_2H_4O_2SO_2HO$ (a discovery due to our own chemists, Faraday and Hennell), in

1820). On distilling this acid diluted with water, dilute alcohol comes over, which, on redi-tillation, in contact with quick-lime, yields pure *vinic* or *ordinary alcohol*, $C_4H_6O_2$. Having thus obtained ordinary alcohol from inorganic materials only, we may employ it to form by synthesis an immense number of other organic compounds. By means of what is known as "the process of Mendius," we can, as it were, step from one alcohol to the next above it. Thus, from vinic alcohol ($C_4H_6O_2$) we obtain *propylic* (or *tritylic*) *alcohol* ($C_6H_{10}O_2$); from this we obtain *butylic* (or *tetrylic*) *alcohol* ($C_8H_{14}O_2$); from this, *amyllic alcohol* ($C_{10}H_{22}O_2$), and so on. From the propylic alcohol thus obtained we get, by oxidation, *propionic acid*, from which *lactic acid*, the acid of sour milk, may be obtained; similarly, butylic alcohol yields butyric acid; every alcohol, in short, yielding a corresponding fatty acid by oxidation. *Glycerine*, the base of the fats, may also be obtained by a somewhat circuitous process. By combining glycerine with propionic acid, and with the other fatty acids which may be synthetically formed, we obtain several oils and fats similar to those which occur as natural products. The case of *taurine*, $C_4H_7NS_2O_6$, is even more striking; it is a product of various glandular metamorphoses, but its chief source is the bile, where it exists in conjugation with cholic acid as tauro-cholic acid. This highly complex substance can readily be formed in the laboratory from sulphuric acid, alcohol, and ammonia, each of which is capable of being built up from its constituent elements.

Sugar has been obtained by Berthelot from glycerine, a substance which is obtainable by purely inorganic means; but as he effected the conversion of the glycerine into sugar by the action of putrefying animal tissue, we can hardly regard the sugar thus formed as being of purely inorganic origin, although the animal tissue only acted catalytically, or as a ferment, and did not contribute any actual material to its formation. There is, however, no doubt that an unexceptional means of producing this important alimentary substance will soon be devised, since bodies strictly allied to sugar have been already obtained.* Another artificial compound of great interest in an industrial point of view is *toluol*, C_7H_8 , which has recently been obtained from phteuole, which can itself be produced synthetically from alcohol. "Starting," says Dr. Odling, "from these two bodies, we may procure all the so-called coal-tar colors, with the brilliancy and variety of which most of us are now familiar. The red base or rosaniline, $C_{16}H_{12}N_3$, the violet base or triethylosaniline, $C_{22}H_{12}N_3$, and the blue base or triphenylosaniline, $C_{18}H_{12}N_3$, being producible in this way from their constituent elements, furnish admirable illustrations of the constructive powers of modern organic chemistry."

We cannot conclude without adverting briefly to the possibility of economically replacing natural processes by artificial ones in the formation of organic compounds. On this subject, one of our most distinguished organic chemists, Dr. Frankland, observes that "at present, the possibility of doing this only attains to probability in the case of rare and exceptional products of animal and vegetable life. By no processes at present known could we produce sugar, glycerine, or alcohol from their elements at one hundred times their present cost, as obtained through the agency of vitality. But although our present prospects of rivaling vital processes in the economic production of staple organic compounds, such as those constituting the food of man, are exceedingly slight, yet it would be rash to pronounce their ultimate realization impossible. It must be remembered that this branch of chemistry is as yet in its merest infancy; that it has hitherto attracted the attention of but few minds; and further, that many analogous substitutes of artificial for natural processes have been achieved."

For further details on this subject, the reader is referred to Berthelot's *Chimie Organique fondée sur la Synthèse* (2 vols. Paris, 1860); to the same author's lectures on the *Leçons de Chimie professées en 1860 et 1862*; to various lectures by Wanklyn, Frankland, and others, delivered at the Royal Institution; and to Odling's lectures *On Animals Chemistry*, delivered at the college of physicians in the year 1865.

SYNTONIN, or MUSCLE FIBRINE (Gr. *synteinein*, to render tense), contains in 100 parts: carbon, 54.06; hydrogen, 7.28; nitrogen, 16.05; oxygen, 21.50; and sulphur, 1.11. It is the principal constituent and the essential basis of all the contractile tissues. It may be obtained from muscular fibrin in the form of a coherent, elastic, snow-white mass; but whether it exists in the living body in a solid form or in solution, is undecided. Many recent physiological writers hold the latter view, and maintain that the phenomenon of cadaveric rigidity (*rigor mortis*) is due to its spontaneously coagulating after death.

SYPHILIS, is according to Dr. Farr's system of nosological classification, to be regarded as belonging to the enthetic order of zymotic diseases (see *NOSOLOGY and ZYMOTIC DISEASES*). These diseases have the common property of being developed in the system after the introduction by inoculation or implantation of specific poisons. The poisons which produce diseases of this order may be introduced through any abraded cutaneous surface, or through mucous membranes, especially if any solution of continuity occurs. A morbid poison thus introduced into the system produces a specific effect both on the tissue at the place of insertion and on the blood, as soon as the poison

* Carius, a trustworthy chemist, announced some years ago that he had succeeded in forming phenose, a kind of sugar, and possessing all its chemical characteristics, from benzol.—*Ann. d. Chem. u. Pharm.* Dec. 1865.

begins to be become absorbed; or, in other words, it produces both a constitutional and a local change. The absorbed virus seems to undergo the following changes in the living and infected body—viz. (1) Increase, (2) Transformation, and (3) Separation or excretion. Taking our illustrations from the disease to which this article is specially devoted, the *increase* is shown by the fact, that the pus from a single syphilitic sore may by inoculation be made to spread the disease a thousand-fold. The *transformation* is indicated by the successive phenomena which supervene during the course of the disease. For example, syphilis is followed, as we shall presently show, by a series of secondary and tertiary phenomena, which follow a tolerably uniform course in different patients. The *separation or excretion* of the poison may be accomplished in several ways. While in some of the more intense poisons—such as those of certain serpents—the whole mass of the blood seems rapidly affected, in others, as syphilis, “a double process of the zymotic-like action seems to take place before the full effects which the poison is capable of producing are completed. The multiplication of the venereal poison, and its effects upon the system, seem to become developed during the existence of the hardening process which surrounds the infecting venereal sore. This is the first zymotic-like process, and is attended with a local papule, and perhaps an ulcer. From this local sore the system becomes contaminated, and in the blood a second process (of zymosis?) appears to be completed, by which the original poison becomes intensified, its pernicious influence more complete, and its specific, secondary, and tertiary effects are more fully developed.”—Aitken's *Science and Practice of Medicine*, 3d ed., vol. i. p. 666.

From this brief sketch of the nature of enthetic diseases, we turn to the consideration of the special disorder known as *syphilis*—a word whose origin is unknown. The terrible ravages of this disease among our soldiers and sailors, to say nothing of the fearful misery which it occasions in private life, afford more than sufficient apology for our introducing into these pages some of the most important details regarding this repulsive form of disease.* It is almost unnecessary to observe that syphilis is a contagious disease usually propagated by impure sexual intercourse. The following is a brief history of the course of the disease, if its progress is not checked by proper remedial agents. At an uncertain period, varying from three to ten days, after exposure to the infection, one or more venereal ulcers (commonly known as *chancres*) appear upon the generative organs. These ulcers present many varieties, which have been variously classified. The following arrangement, by Mr. Henry Lee, surgeon to the Lock hospital, is an eminently practical one—viz. (1) The Hunterian or indurated or infecting chancre; (2) The non-indurated or suppurative chancre; (3) The ulcerative chancre; and (4) The sloughing chancre. These local affections are so different in their characters, and in their action on the constitution, that each must have a brief separate notice. (1) The *indurated*, or, as it is frequently termed, the *Hunterian chancre*, from its having been first accurately described by John Hunter, is the only one of these local affections that can be associated with constitutional syphilis. Its natural course is thus described by Mr. Lee. “At an uncertain period, but generally from three to four days after exposure to infection, attention may be drawn to the part by a slight itching. On examination, a red spot, surrounded by a little induration, will, perhaps present itself, or a vesicle about the size of a millet-seed will not unfrequently form upon the infected part. The cuticle covering this vesicle is so thin that it usually gives way at a very early period; and this commonly happens before the disease has been carefully examined. The base of the vesicle then becomes indurated, and the induration (whether preceded or accompanied by a pimple or a vesicle, or independent of either of these) assumes a circular form, extending equally in every direction, and terminating quite abruptly in apparently healthy parts. A sore generally follows; this is excavated, without granulations, sometimes glazed, at other times having some adhesive matter on its surface. The color of the chancre will depend often upon the amount and character of the substance which adheres to it, and will frequently present a fawn hue, or different shades of brown and red. When this adventitious matter is removed, the sore will usually again assume its original smooth and red glazed appearance.”—“Syphilis” in Holmes's *System of Surgery*, vol. i. p. 400. This variety of sore frequently gives rise to a chronic enlargement of one of the glands of the groin (forming what is termed a *bubo*), which does not involve the skin or the cellular membrane. It is followed by certain

* Dr. Aitken observes that “no statistical nosology gives any idea of the number of men lost to the public service from syphilis. The loss of strength from venereal diseases alone (gonorrhoea being included with syphilis in this term, and forming about 40 per cent of the cases) is equal to the loss of more than eight days annually of every soldier in the service.” Dr. Balfour in his *Medical, Sanitary, and Statistical Report of the Army Medical Department for 1860*, relates that “more than one-third of all the admissions into hospital have been on account of venereal diseases (369 per 1000), and the average number constantly in hospital is equal to 23.69 per 1000 of strength (2,315 men), each remaining in hospital on an average 23½ days. Thus the inefficiency is constantly equal to about 2½ regiments.” In 1861, these diseases caused a loss equal to 8.69 days for every soldier serving at home, there being a daily inefficiency of 2,077 men; and the numbers are nearly the same for the succeeding years. The daily loss of service in the navy, in 1862, was about that of 586 men per day. How far these data apply to our civil population, it is hard to say; but it is much to be feared they apply pretty closely. “It is a question,” says Dr. Parkes, “whether a large majority of the young men of the upper and middle class do not suffer in youth from some form of venereal disease. In the lower classes, it is perhaps equally common.”—*Practical Hygiene*, p. 453. For a comparison between the amount of venereal disease in our own and other armies, the reader may consult the same work, pp. 502, 503.

constitutional symptoms known as *secondary symptoms*, and requires, both in its primary and secondary forms, mercurial treatment. (2) The *suppurating chancre* usually begins as an abrasion, which when fully developed, often presents the same appearance as if a piece of skin had been removed by a circular punch. The sore is covered with ill formed granulations, and extending equally in all directions, maintains its circular form. After continuing three or four weeks, it generally heals, without leaving the hardness which is so characteristic of the Hunterian, infecting or indurated sore. An other important diagnostic difference is furnished by the microscopico-chemical examination of the fluid secreted by the sore. In this suppurating sore the secretion consists of pus, which, on the addition of acetic acid, exhibits the characteristic compound nuclei; while in the infecting sore the secretion resembles turbid serum, presenting none of the characters of the pus. It does not give rise to bubo, nor is it followed by secondary symptoms. (3) The *ulcerative chancre* is a ragged worm-eaten ulceration; secreting an ill-formed pus, and presenting an irritable surface. Soon after the appearance of this sore, one of the glands of the groin will become enlarged and painful. This may be preceded by a shivering fit, more or less marked. The enlarged gland or bubo becomes very tender to pressure, and as the swelling increases, the skin becomes red, especially at the center, and the general symptoms of suppuration present themselves. Great relief is afforded by the discharge of the pus. It is never followed by secondary symptoms, and, like the preceding form, requires only local treatment. (4) The *sloughing chancre* is fortunately rare in this country, but in many foreign ports, in warm and hot countries, this form of syphilis commits great ravages among our sailors, who have given to it certain characteristic names, such as the *black pox*, the *black lion*, etc. It does not affect the inguinal glands, and is not followed by constitutional symptoms, and requires only local treatment.

Before noticing the constitutional or secondary symptoms which follow the Hunterian or infecting sore, we shall very briefly describe the treatment required for the last three forms, in which no constitutional symptoms occur. A suppurating sore should at once be thoroughly cauterized, so as to destroy all the tissues which have imbibed the poison. To secure this result, strong caustics are desirable; and as they sometimes extend further than is desired, an antidote should be at hand, which not only checks the further extension of the caustic, but deadens the pain. The agents most used in these cases are caustics and the mineral acids, and the *potassa cum calce*, a combination of potash and lime, which is prepared in the form of small rods for this purpose. The last of these is on the whole the best, as the extent to which it acts may be accurately regulated. When the action is sufficient, the application of a dilute acid will relieve the pain. Nitrate of silver, which is often employed, is not sufficiently energetic in its action to eradicate the disease. In the ulcerative sore, which is often irritable and painful, opium is useful both locally and internally. In other respects, the same treatment must be adopted as in the preceding variety. As the various means that have been suggested for preventing the suppuration of the bubo, which always accompanies this sore, are of no avail, it is useless to mention them. If, after the bubo has burst, the remains of an indolent, enlarged gland, incapable of forming healthy granulations, are left, caustic must be applied, so as to cause them to slough away. In sloughing sores, the great object is to check the destructive process; for which purpose, fomentations and poultices are applied locally, and large and repeated doses of opium are given internally. The nitric acid lotion, or a solution of potassio-tartrate of iron (10 grains to an ounce of water), is often an efficient local application in these cases.

We now return to the consideration of the Hunterian or indurated chancre, the only variety of venereal sore that gives rise to secondary or constitutional symptoms. If the patient seeks medical assistance as soon as he perceives the sore, it is possible that the application of a caustic will destroy the poison, and prevent any constitutional symptoms. If, however, four days or more elapse before treatment commences, the best local application is some form of mercury, as mercurial ointment spread on lint, or the application of black wash (see LORROUX) steeped in the same material. When the poison has once entered the circulation, and become diffused throughout the body, it is desirable to neutralize it, if possible, before the appearance of any secondary symptoms. A very large number of drugs have at different times possessed an anti-syphilitic reputation, and a few are doubtless useful; as, for example, iodide of potassium. "There is one medicine alone," says Mr. Henry Lee, one of the highest British authorities on the subject, "which, through good report and evil report, in spite of the strongest prejudices of some against its use, and the no less adverse influence of others, who have employed it to an unjustifiable extent, has maintained its general reputation."—*Op. cit.*, p. 418. In these remarks on the value of mercury (if judiciously given) we fully concur; but the mercurialists and non-mercurialists are almost equally divided. It may be given internally in pills or in solution; or it may be introduced into the system through the skin, in the form of ointment; or lastly, it may be employed in the form of vapor, and thus applied to the skin. Of these three methods, none is equal to mercurial fumigation by calomel vapor, either in the readiness with which it removes the symptoms, or the slight disturbance it excites in the constitution, or in its certainty in preventing relapse. This process is a very simple one. A piece of brick must be heated to a dull red heat, and placed in a pan having a little water at the bottom. A quantity of calo-

mel, varying from 10 to 20 grains, is placed on the top of the brick; and the patient then sits over the pan in a cane-bottomed chair, enveloped from his neck downward in a large blanket.* The operation is best performed at bedtime; it is complete in a quarter of an hour; and when the patient is sufficiently cool to put on his night-shirt, he should go to bed without disturbing the calomel on the surface of the skin. It is almost impossible to produce salivation by this means of administering mercury; and all that is requisite is to produce a slight tenderness of the gums. The system must be kept under this gentle influence of the mercury till the induration in the primary sore has disappeared. At a period usually varying from one to two months after the first appearance of the induration (which is regarded by some writers as the first of the secondary symptoms), slight febrile symptoms, usually followed by an exanthematous eruption of the skin, often accompanied by sore throat, will occur. This eruption is a variety of *roseola*; it is of a rose-red color, which disappears on pressure, and is not raised above the surface. It generally disappears in a few days, but if it persist, it will gradually change to a copper color, which is characteristic of all syphilitic eruptions which remain for a considerable time without suppurating or ulcerating. The syphilitic eruptions which usually follow this primary rash may assume the varied forms of lichen, syphilitic tubercle, lepra, and psoriasis; and the best mode of treating them is by applying local mercurial fumigation, and at the same time giving iodide of potassium (in five-grain doses thrice a day) internally. Occasionally, in persons with impaired constitutions, syphilitic eruptions assume a pustular character. For a description of these eruptions, we must refer to Cazenave's *Manual of Diseases of the Skin*, translated by Burgess. Similarly, there are cases in which, from some constitutional peculiarity, or, as Mr. Lee suggests, from some want of power in carrying out the natural processes of the disease, the syphilitic eruption may be accompanied by an effusion of serum only; or, in other words, may be of the vesicular type. Thus, we hear of syphilitic herpes, syphilitic eczema, etc. These forms must be treated as the others.

Among the secondary syphilitic diseases of the mucous membrane, may be especially noticed (1) mucous tubercles, (2) deep ulcer of the tonsils, and (3) syphilitic laryngitis. *Mucous tubercles* appear as small tense eminences inside the cheeks, on the arches of the palate, on the lips, on the generative organs, and on the rectum. A solution of corrosive sublimate applied locally (one or two grains to the ounce of water), or calomel, proves an effective local application. *Deep ulcer of the tonsils* is best treated by corrosive sublimate given internally, in doses of $\frac{1}{2}$ of a grain three times a day, in compound tincture of bark and water; and also used as gargle (in the proportion of 2 grains to a mixture of 7 ounces of water and 1 of honey). *Syphilitic ulceration of the larynx*, commonly known as *syphilitic laryngitis*, is characterized by pain or tenderness in the region of the thyroid cartilage (see LARYNX), huskiness of the voice, a hacking cough from attempts to expectorate, with occasional expulsion of purulent matter mixed with blood. If the disease is not checked, enervation, night-sweats, and dangerous exhaustion, ensue, and life is often terminated by suffocation.

In noticing the secondary symptoms, *syphilitic iritis* must not be overlooked; its symptoms and treatment are described in the article IRITIS.

Our limited space precludes more than a very brief allusion to the more important *tertiary syphilitic affections*. The most important of these are those which attack the bones and their coverings. They may be included under the heads of acute and chronic periostitis (the latter being very common), nodes and exostosis, inflammation of bone, caries, and necrosis; next to these are tertiary affections of the skin and mucous membrane, which consist mainly of intractable ulcerations attacking the face (especially the nose and lips), nails, ears, and mucous membranes of the various openings of the body; and diseases of the glands. In many of these cases a modified form of mercurial fumigation is most useful; but if mercury, even in this form, is thought inexpedient, in consequence of the general debility of the system, iodide of potassium, combined with any of the preparations of sarsaparilla, may be employed. Bark, iron, and the mineral acids are also of service in restoring the strength; and opium, by relieving the nocturnal pains which are so frequently present, will also prove most useful. The reader who wishes to pursue this subject further may be referred to Aitken's *Science and Practice of Medicine*, in which he will find an account of the tertiary syphilitic affections of the nails, heart, brain, lungs, liver, and tongue.

THE SYPHILIS OF CHILDREN is a subject which must not be omitted in an article on this disease. If the constitution of either the father or mother of an infant is saturated with the syphilitic poison, the child may be born with certain symptoms indicating that it is suffering from *congenital syphilis*. Moreover, the child of a mother having a primary sore, but no constitutional symptoms, may be inoculated with syphilis during the act of delivery; or the disease may be communicated in vaccination (if the matter be derived from an impure source); or by contact with syphilitic sores on the persons of wet-nurses or others. All these cases are included in the *infantile* variety of the disease. One of the most striking symptoms of true congenital syphilis is that which is popularly known

* A simple apparatus for mercurial fumigation, consisting of a kind of tin case containing a spirit-lamp, may be procured from Messrs. Savigny & Co., St. James's street, by those who object to rough bricks and coarse pans. A special fumigating cloak, in place of the blanket, is sold with the apparatus.

as the *snuffles*, in which a discharge collects in the nose, and sometimes blocks it up so completely that the infant is unable to suck for any length of time. The skin presents an eruption of spots, which are usually somewhat coppery, but sometimes of a rose-red tint; while on the soles of the feet and the palms of the hands the cuticle scales off, and an appearance like that of psoriasis is presented; and flat mucous tubercles occur at the parts where the skin and mucous membrane merge into one another. White ulcers of a crescentic form often occur in the mouth; and with these symptoms there is nearly always observed "the wizened and shrunken look, the anxious expression, and the dirty hue of the skin (a kind of dirty greenish yellow), which imparts to the infant a peculiarly repulsive aspect of old age."—Holmes, "On the Surgical Diseases of Childhood;" *op. cit.*, vol. iv, p. 830. Congenital syphilis frequently causes the death of the fetus at about the fourth or fifth month; and if a woman is repeatedly delivered of dead children from the fourth to the seventh month, the practitioner may fairly conclude that a syphilitic taint is *probably* present. In other cases the child is born alive with the "snuffling" and eruption; but, in the majority of cases, the infant when born is apparently healthy, and the disease does not show itself till about six weeks after birth.

When congenital syphilis is diagnosed with certainty the medical attendant has a very important duty to perform, from which he must not shrink from any feelings of delicacy. He must discover which of the parents is affected, and must prohibit further cohabitation until the secondary symptoms have been completely removed by the treatment which has already been described. "Neglect of this precaution," says Mr. Holmes, in his excellent memoir on congenital syphilis (contained in the 4th vol. of his *System of Surgery*), "may not only entail on the couple the misery of a family of deformed, puny, and ailing children, but to the woman at least is fraught with grave personal danger. Whatever may be the case among the poor, there is no doubt that, in the better classes, congenital syphilis is usually derived from the father, the mother being unaffected except through the fetus." There is scarcely a doubt that a woman carrying a syphilitic fetus may become thus infected with secondary syphilis by the exchange of fetal and maternal blood in the placenta; and this explains how it is that women who have never had the primary infecting sore occasionally show all the symptoms of secondary syphilis after living for some years with husbands similarly affected.

Allusion has already been made to the fact that *infantile* (not *congenital*) syphilis may be communicated by vaccination. There is undoubted evidence that in the year 1861, in a thinly populated district of Piedmont, in which syphilis is virtually unknown, 46 children of various ages were simultaneously attacked with syphilis proceeding from chancres in the arm, and followed by buboes (enlarged glands) in the armpits; and that all these children had been vaccinated directly or indirectly from a single child, who was subsequently proved to have contracted syphilis from a wet-nurse; and further, that these children transmitted the same disease to a number of women, their wet-nurses, mothers, etc., and even to children who nursed and played with them; that the women so infected communicated the disease to their husbands; and finally, that the disease yielded in all cases to the ordinary treatment adopted in syphilis. This, as Mr. Holmes observes, is by far the most convincing instance of the propagation of syphilis by vaccination; but several others are recorded by Mr. Lee (*Lectures on Syphilitic Inoculation*, 1863) and other writers.

Cases in which the nipple of the wet-nurse has been infected by a syphilitic infant are by no means rare, and have in various instances given rise to litigation.

Congenital syphilis and infantile syphilis generally must be treated with mercury—either in the form of inunction, by keeping a flannel band, smeared twice a day with mercurial ointment, in constant contact with the thigh or arm for about six weeks; or internally, by the careful use of gray powder (*hydrarg. c. cretâ*), in doses of a grain and half or two grains, twice a day; combined with a little compound chalk-powder, if any irritation of the bowels occurs. The snuffles will be relieved by syringing the nostrils with lukewarm water, and then introducing a couple of drops of almond or olive oil.

In a foot-note to an early paragraph of this article, we gave abundant evidence of the appalling prevalence of this disease. In his valuable treatise on *Practical Hygiene*, Dr. Parkes discusses the question of the prevention of this disease among soldiers; as, however, his remarks for the most part are applicable to other classes, we shall briefly notice them. The means of prevention which he discusses are. 1. *Continence*, which is promoted by (a) the cultivation of a religious feeling and of pure thought and conversation; (b) the removal from temptation and occasions to sin; (c) constant and agreeable employment, bodily and mentally; and (d) temperance. 2. *Early marriage*.—At present only 6 per cent of our soldiers are allowed to marry. 3. *Precautions after the risk of contagion*.—In some French towns the use of lotions and washing is vigorously enforced, with the effect of lessening disease considerably. 4. *Cure of the disease in those affected by it*.—Health-inspection, in special reference to venereal diseases, are made weekly in our army by the surgeon or assistant-surgeon; and although similar inspections of all recognized prostitutes have long been made by legal authority in many parts of the continent, no attempt at legal interference with the disease in women was made in this country till 1864, when the "contagious diseases bill" was passed, by which, in the neighborhood of certain places (Portsmouth, Plymouth, Woolwich, Chatham, Sheerness, and Aldershot), prostitutes who are found diseased may be taken to an hospital, and

there detained till cured. A committee appointed a few years ago by government to report upon the best means of checking the disease in the army and navy, in Feb. 1866 issued their recommendations; the most important of which are—(1) the periodic inspection of all known prostitutes in the garrison towns placed under the provisions of the act of 1864; (2) the appointment of a surgeon vested with the necessary powers; (3) punishment for infringement of the act; (4) the extension of its operation to all garrison and seaport towns used by troops or ships; (5) the prohibition of the residence of public women in beer-shops; (6) that the Lock hospitals be placed under government control, and lastly, that the police supervision of the women in the streets of such towns be more stringent. The evidence taken by this committee unquestionably proved that the working of the act of 1864 was decidedly useful, although its application was so limited. For an account of the various plans which are adopted on the continent for the prevention of this disease—such as the registration of brothels and of prostitutes, and the enforcement of periodic examinations at short intervals—the reader is referred to the various works of Parent-Duchatelet, Acton, Sanger, and others on prostitution; and to two articles on the same subject by Dr. Holland (of Cork) in the *British and Foreign Medico-Chirurgical Review* for 1852.

Without entering into any prolonged details regarding the history of this disease, we may briefly mention that, toward the close of the 15th c., a great epidemic of syphilis pervaded Europe, and that it was supposed to have been imported from the new world; and that, in the 16th c., syphilis was recognized as the result of a specific virus. During last century the history of this disease is divisible into three distinct periods, in each of which very different views have been prevalent. These may be described as—1. *The period and doctrine of Hunter*, who believed that the various forms of syphilis, and gonorrhea depend upon one and the same poison—a view taught by Carmichael in Dublin, Cazenave in Paris, and others. 2. *The period and doctrine of Ricord*, who proved that gonorrhea was quite different from syphilis, and that inoculation with gonorrheal matter will not cause a chancre; and that there are *two* classes of chancers, the *soft* and *hard*, originating from the same source. 3. *The present period*, commencing in 1856, in which it is held that, exclusive of gonorrhea, there are *two* forms of the syphilitic poison. It has been judiciously advised by Mr. Longmore, the professor of military surgery in the army medical school, that in accordance with our present knowledge of this disease, the term *syphilis* or *syphilitic* should be restricted to such cases as are believed to be of a specific infecting kind, while the term *local venereal sore* or *venereal ulceration* should be applied to those cases which require merely local treatment, and are not followed by constitutional symptoms.

SYPHILIZATION is the term used to designate an operation which has the double object of eradicating syphilis already existing in the system, and of securing permanent immunity from any future attacks, by means of repeated inoculations of syphilitic poison. As long ago as the year 1844, a French physician, Auzias Turenne, undertook a number of experiments, with the view of testing whether John Hunter's view, that syphilis could not be communicated to the lower animals, was correct. After some failures he succeeding in producing venereal sores (chancers) in monkeys by inoculating them with the human virus; and he found that rabbits, cats, and horses might be similarly infected from the chancers of the monkey. He likewise found that the chancers produced by inoculation became less and less in each animal, until a period at length arrived at which the poison seemed to have lost all its power, and no further sores could be produced; and he was thus led to believe that by prolonged inoculation the system became protected. The subject was next taken up by Sperino of Turin, who inoculated patients suffering from syphilis by virus from a chancre, and repeated the inoculation once or twice a week, till the poison—as in the case of Turenne's animals—ceased to produce any effect; and when this point was reached, all the other sores had healed. In 1851 prof. Boeck of Christiania, when traveling through Italy, had his attention drawn to the doctrine of syphilization; and from that time to the present, he has devoted himself unremittingly to it, and is now the great authority on the subject. In 1858 Boeck, in consequence of the results he had attained from the practice of syphilization in cases where no mercurial treatment had been prescribed, alleged that syphilization might in such cases be regarded as a complete and certain cure. In cases where mercurialization has been practiced, the use of iodine has to be persisted in during syphilization. During the summer of 1865 Dr. Boeck visited London, and took active steps to make his views on this subject accurately known in this country, and the surgeons of the Lock hospital submitted a series of cases to his mode of treatment; and Mr. James Lane, one of the surgeons to that institution, asserted in 1866 that "hitherto, as far as he had seen, it had effected everything which had been promised for it. The progress of the cases in the Lock hospital had in almost every detail corresponded to the predictions of prof. Boeck respecting them. In several of those who had been longest under treatment, immunity from inoculation with primary syphilitic matter had been arrived at." The progress of syphilization as a remedy for syphilis and as a proof against syphilitic infection, has not been well marked in this country. Most surgeons are agreed as to the correctness of prof. Boeck's views, but the practice itself is offensive, and the length of time necessary for its being effectively carried out forms

an objection to its practice. In Sperino's experiments, the treatment extended from 9 to 20 months or more. The practice has been much in vogue in Christinia under Boeck and his colleague M. Bidenkap; but it is unlikely to command attention other than of scientific kind, and as tending to acquaint us with the history of syphilis and with the nature of syphilitic infection.

SYRA (anc. *Syros*), the most important, though not the largest member of that group of islands in the *Ægean* sea known as the Cyclades (see GREECE), lies 13 m. s. of Andros. It is about 10 m. long by 5 broad, bare, hilly, and not very fertile. The products are wine, tobacco, grain, citrons, figs, honey, and vegetables; but the greater portion even of the common necessities of life have to be imported from Greece and foreign countries. Its prosperity is of quite modern growth. During the war of independence, Syra remained neutral, and, in consequence, numerous fugitives flocked thither from other parts of Greece, especially from Chios and Psara, who, besides adding largely to the population, brought with them a spirit of political activity and commercial enterprise, the beneficial effects of which are now strikingly visible. Pop. 30,643. The capital, *Syra* or *Hermopolis*, is situated on a bay on the e. side of the island. It rises terrace-wise from the shore, is well built, and is the seat of government for the Cyclades, and the residence of foreign consuls. It has numerous educational institutions, 4 printing-presses, and 3 weekly newspapers. Syra has become the great commercial entrepot of the *Ægean*. Nearly one-half of all the imports of Greece reach it through this port. It builds more ships than any other town in the Levant, and owns one-third of all the Greek merchantmen. It has likewise regular steam communication with all the principle trading-towns in the Levant. Pop. of the town of Syra, '71, 20,996.

Ancient notices of Syra are scanty. Homer praises it in the *Odyssey* as "rich in pastures, in herds, in wine, in wheat;" but it has no history.

SYRACUSE, anciently the most famous and powerful city of Sicily, situated on the south-eastern coast of the island, 60 m. s.s.w. of Messina, was founded by a body of Corinthian settlers under Archias, one of the Bacchiadae, 734 B.C. The original colonists seem at first to have occupied nothing more than the little isle of Ortygia, about 1 m. long, and half a mile broad, which lies near the shore. It rapidly rose to prosperity, and was enabled to establish sub-colonies of its own: Acraë (664 B.C.), Casmenæ (644 B.C.), and Camarina (599 B.C.). Nothing definite is known of the early political state of Syra; but before 486 the political power had passed into the hands of a few leading families, or perhaps *clans*, who constituted an oligarchy, while the great body of the citizens formed a malcontent democracy. In that year a revolution took place. The oligarchic families—*Geomori* or *Gamori*, "landowners;" probably the descendants of the original colonists, like the patrician *gentes* of Rome—were expelled, and the sovereign power was transferred to the citizens at large. Before a year passed, however, Gelon (q.v.), "despot" of Gela, had restored the exiles, and at the same time made himself master of Syracuse. He was a great ruler, and under him the city increased in size and wealth. It is believed to have been in Gelon's time that the adjoining mainland was first built upon. The locality of the new settlers was the slopes and heights of Achradina, or the "outer city," a triangular table-land n. of the island of Ortygia, and subsequently connected with it by a mole. It ultimately became the most extensive and populous quarter of Syracuse—contained the agora, a temple of Zeus Olympios, the Prytæneum, with a splendid statue of Sappho, the fine monuments to Timoleon and the elder Dionysius (q.v.), etc. It may be convenient to mention here the other two quarters of the city, especially as the date of their settlement is not known. These were Tyche—so called, according to Cicero, from an ancient temple of "fortune" erected there—occupying a plateau to the w. of Achradina; and Neapolis (new city), stretching along the southern slopes of the plateau, and overlooking the marshes of the Anapus and the "great harbor," a spacious and well sheltered bay, about 5 m. in circumference. Neapolis became one of the finest parts of Syracuse. Here were situated the theater, amphitheater, and numerous temples, of which hardly a relic remains, except of the first mentioned. Ortygia contained the castle or citadel which immediately fronted the mainland, and overlooked the docks or *navalia* in the "lesser harbor."

Reverting to the history of Syracuse, which we must touch upon only in the most cursory manner, a noticeable characteristic of the reign of Hiero (q.v.), the successor of Gelon, is his cultivation of the fine arts, and his liberal patronage of men of genius, as *Æschylus*, *Pindar*, etc. In 466 B.C., the democracy again got the upper hand—*Thrasylbulus*, a "tyrant" of the baser sort, being expelled; and for sixty years a free and popular government was enjoyed, under which Syracuse flourished more than it had ever done. During this period occurred its great struggle with Athens (413-14 B.C.), in which it came off victorious, and its renown at once spread over the whole Greek world. But a new power appeared on the stage—the Carthaginian, whose conquests in Sicily, toward the close of the 5th c., threatened the supremacy of Syracuse. Meanwhile, Dionysius (q.v.) restored the "tyranny" of Gelon, and during a reign of 38 years greatly increased the strength and importance of the city. It was he who constructed the docks in the greater and lesser harbors, and surrounded the city with fortifications. His fierce and victorious war with Carthage (397 B.C.) raised the renown of Syracuse still higher. The reigns of the younger Dionysius (q.v.) and of Dion were unsettled; but

after the restoration of public liberty by Timoleon (344 B.C.), a brief season of tranquillity ensued, during which the prosperity of the city rapidly revived. Under Agathocles, however, the despotic form of government was again established (317 B.C.), and continued, with scarcely an interruption, down to the conquest of the city by the Romans (212 B.C.) during the Hannibalic war—the ruler of Syracuse, Hieronymus, a rash and vain young man, having abandoned the prudent policy of his grandfather, Hiero (q.v.), broken the alliance with Rome, and joined the Carthaginians.

Under the Romans, Syracuse slowly but surely declined, though it always continued to be the capital and first city of Sicily. Captured, pillaged, and burned by the Saracens (878 A.D.), it sunk into complete decay, and is at present confined to its original limits, Ortigia, which, however, is no longer an island, but a peninsula. Pop. '72, 22,179. The streets of the modern town are, with few exceptions, narrow and dirty. Syracuse has a cathedral, a museum of classical antiquities discovered in Syracuse and the neighborhood, a public library, with some curious MSS., numerous churches, monasteries, and nunneries, and carries on a trade chiefly with Malta in wine, oil, salt, and salt fish. It has several remains of ancient and medieval edifices, which are much visited by travelers.

SYRACUSE, a province in e. Sicily, on the coast; drained by the Abisso, Anapo, and Ragusa rivers; about 1400 sq.m.; pop. '73, 294,885. The surface is mountainous except in the south. Along the sea-coast and in the river valleys the soil is fertile, and adapted to pasturage. Agates and marbles are found. The principal agricultural productions are corn, barley, hemp, flax, wines, and olives. It comprises 3 districts, Syracuse, Modica, and Noto. Capital, Syracuse.

SYRACUSE, a city of central New York, at the head of Onondaga lake, on the Erie canal, and at the junction of the New York Central and Oswego railways, 148 m. w. by. n. of Albany. From its central position it is called the city of conventions. It contains a handsome court-house, state arsenal, state asylum for idiots, 41 churches, 3 daily and 11 weekly newspapers, 13 banks, schools, and libraries. Here are the largest salt-works in America (producing in 1874, 6,029,300 bushels of salt), 5 iron-furnaces, 14 machine-shops, manufactories of silver, tinware, sheet-iron, coach and wagon factories, and breweries. Pop. '75, 49,808.

SYRACUSE (*ante*), a city and county-seat of Onondaga co., N. Y.; pop. '80, 51,791. Its public buildings include the court-house, banks, and churches; it is well laid out, and the Syracuse university and Oakwood cemetery are objects of interest to visitors. Its principal industry is the manufacture of salt, which has existed from the first discovery of the springs by the Jesuits in 1654. In 1797 these were taken possession of by the state, and laws passed for the conduct of the manufacture. Twenty salt companies now pursue this industry, having invested in it a large capital, and employing many operatives. From 1797 to 1806, inclusive, the quantity manufactured was 78,000 bushels; 1807 to 1816, 267,000; 1827 to 1836, 1,594,000; 1837 to 1846, 3,053,000; 1847 to 1856, 5,083,000. The salt-springs are on the shore of the lake, near the city, and are reached by horse-cars. The entire product of all the manufactures of Syracuse was valued in 1874 at about \$14,000,000. The most important include Bessemer steel works, rolling-mills, blast furnace, foundries, and boiler-works, railroad journal-boxes, fruit-canning, musical instruments, etc.

SYRIA (Arab. *E'sham*, Turk. *Soristan*), a division of Asiatic Turkey, bounded on the n. by portions of Asia Minor, on the w. by the Levant, and on the s. by Arabia Petrea; on the e. and s.e. its boundary is rendered indefinite, in great part, by the sands of the desert, but at length becomes fixed by the course of the Euphrates. It is divided into several governments, which frequently change their limits. They are usually named after the principal towns—Aleppo, Damascus, and Beyrout. The area is about 146,000 sq.m.; pop. about 2,250,000. The whole region is traversed by a double mountain-chain—of which Lebanon (q.v.) forms the highest part—touching in its northern extremities the Alma Dagh (anc. *Mons Amanus*), and in its southern forming the Sinaitic range. The central part of this mountain system, which in many places exhibits the characteristics of a plateau, presents on the w. a steep front toward the Mediterranean, but on the e. rolls gradually away into the level uplands of the Syrian wilderness. The most noticeable features of the long *furrow* between the double ridge, beginning at its southern end, the gulf of Akaba, are the waterless wady of Arabah, the narrow, deep-sunken region known as *El Ghur*, through which the river Jordan flows, and which embraces the Dead sea and the sea of Galilee, and the vale of Cœle-Syria (q.v.), and its great continuation northward, watered by the Nahr-el-Asy (anc. *Orontes*). The western ridge is broken through in three places: in the n. by the lower Orontes; in the middle near Tripolis—where the chain of Lebanon properly terminates—and further s., near Tyre, by the Leontes. South of Tyre it recommences in the hill country of western Palestine (q.v.), which finally passes into the desert plateau of El Tyh, in the Sinaitic peninsula. The eastern ridge is less sharply defined, its most conspicuous elevations being Anti-Libanos, the mountains of Moab (east of the Dead sea), and Mount Seir, overlooking the wady Arabah. The principal rivers are the Orontes (q.v.), the Leontes, the Jordan (q.v.), the Barada or Abana, the river of Damascus. The only lakes worth mentioning are the Dead sea (q.v.) and the sea of Galilee.

Although Syria belongs to the countries comprised within the Asiatic rain-zone, yet in general the climate is excessively dry and hot, differing little from that of Arabia. Drought and scantiness of vegetation characterize almost equally the uplands and the valleys. Only where the mountains are lofty, the streams abundant, and the atmosphere somewhat maritime, as in the terraced slopes of Lebanon, do we find some approach to tropical luxuriance in flower, and fruit, and tree. Forests of evergreen, beautiful grassy pastures, and meadow-tracts are found there; and wheat, maize, rice, etc., are largely produced. The cultivation of the vine, the cotton tree, the mulberry, and also the finer sorts of fruits, as the olive and fig, is considerable, while indigo and sugarcane are raised in the valleys of the Jordan and the region round about the Dead sea. The fauna of Syria, like its climate and vegetation, is similar to that of Arabia. The camel is of almost as much importance as further s., and the Syrian deserts, particularly toward the n., are the home of gazelles, hyenas, jackals, bears, buffaloes, and other wild animals.

The greater part of the Syrian mountains is limestone; mountain limestone in Lebanon, chalk in Anti Lebanon, and Jura limestone in Palestine. In the last of these volcanic formations occur, especially in the region of the Jordan and the Dead sea, where hot springs, beds of bitumen and sulphur, the shapes of the hills, and the frequent earthquakes afford unmistakable evidence of volcanic activity. Salt is the only mineral of much consequence, and is exported in considerable quantities; coal, however, is worked near Beyroot. Sheep, goats with hanging ears and silky hair, cattle, mules, and asses form, as in ancient times, a great part of the wealth of the inhabitants.

Silk is the chief article of manufacture—at Aleppo, Beyroot, Damascus, etc.—but cotton and woollen fabrics, gold and silver thread-stuffs, glass, earthenware, leather, soap, etc., are also manufactured in different parts of the country. The want of roads is a great hindrance to industrial activity. The first carriage-road was opened in 1863, between Beyroot and Damascus. The other roads, with the exception of one or two short carriage-ways in mount Lebanon, are mere mule and camel tracks. In 1871 Syria exported grains, seeds, cotton, galls, wool, etc., to the value of £717,404; and imported cottons, woollens, copper, tin, iron, coals, indigo, pepper, coffee, etc., to the value of £1,338,750.

The *religious* sects of Syria are numerous. Most of the people are Mohammedans, but Christians of the Greek church number 180,000; Maronites (q.v.) and Roman Catholics, 310,000; Jews, 40,000; Druses (q.v.), 90,000; lesser sects, about 30,000. The inhabitants are in some sense a mixed people, for the country has experienced many political vicissitudes, but by far the greatest number, whether Christians or Mohammedans, are of Shemitic origin, either Phenician, Aramæan, or Arabic. Their Turkish rulers, however, and such Turkomans and Kurds as we find settled in the n. of Syria, belong to the Turanian race. Arabic is everywhere spoken, and may be considered the national language, since the old Syriac or Aramaic tongue is wholly dead, except among the Nestorians of Kurdistan.

The *history* of Syria stretches far back into remote antiquity. In the time of Abraham (2,000 B.C.) Damascus was a city; in the oldest literature of Greece Sidon figures as the capital of a rich, populous, and civilized state; and in the Hebrew Scriptures, Canaan or Palestine is crowded with towns at the period of its conquest by Joshua; but, like most other so-called nations in early times, Syria did not form a single state; it was rather a congeries of independent states whose inhabitants belonged to the same race. Every important city had its king, whose normal occupation was fighting with his neighbors. Under David and Solomon something like political unity was achieved; yet it does not appear that these great rulers dispossessed of their territories the princes whom they subdued, but only made them tributary, and after their death things reverted to their previous condition. Rezin, a slave, then made himself master of Damascus, and extended the Damascene monarchy over all northern and central Syria; but the conquests of Tiglath-Pileser resulted in its becoming a province of the Assyrian empire. Subsequently the whole land, including Palestine, became part of the successive empires of Babylonia, Media, Persia, and Macedonia. Then followed the dynasty of the Seleucids (q.v.). After their fall Syria passed into the hands of the Romans, who retained it, though not continuously—for on several occasions the Persian Sassanids (q.v.) managed to wrest it from them—until the Arab conquest (7th c. A.D.). During the crusades (q.v.) of the middle ages several Christian principalities were established here, but endured only for a short period. Syria now became a possession of the sultans of Egypt, in whose time it was frightfully devastated by the Mongols. In the 16th c. it was conquered by the Turks, and has ever since formed part of the Turkish empire.

SYRIAC. I. The language is a dialect of the Aramean, anciently spoken throughout Syria, the form preserved in literature being probably that of Edessa. After the Mohammedan conquest, 636 A.D., it was gradually displaced by the Arabic; and since the 13th c. it has been used only as an ecclesiastical language in the Syrian churches, and spoken corruptly in a few districts of mount Lebanon and on lake Oroomiah. This last has by the labors of the American missionaries been made a written language. The Syrian alphabet contains 22 letters, all consonants, read from right to left, and 5 vowels denoted by discritical points. In grammar it shares the Aramaic peculiarities; its

vocabulary contains Persian, Greek, Latin, Arabic, Tartar, and even French and English words—traces of the nations that have ruled Syria. II. The literature corresponding to the condition of the country—which was continually subject to foreign dominion—has no freshness, is made up of translations, and largely on religious subjects. It may be divided into three periods: I. *Before the Mohammedan conquest, 636.* Syriac was then a spoken language, and the universities of Edessa and Nisibis were famous through the east. It produced the Peshito (i.e. the simple) version of the Bible, the oldest Syriac book extant, and accepted among all parties in the Syrian church. The Old Testament version was made by Christian translators directly from the Hebrew, and the New was made at Edessa in the 2d c., or the beginning of the 3d. II. 613–1318 was the period of decay; at the beginning Syriac and Arabic were both spoken, and at the end both were used in books. III. *From 1318 to the present time.* Arabic is the spoken language; and Syriac is cultivated only as an ecclesiastical language, and chiefly in the Maronite college at Rome.

SYRIAC VERSIONS. Apart from the Peshito (q.v.), there were other Syriac versions of the Old Testament current among the Syrian Christians, although they did not acquire canonicity among them. These were chiefly translated from the LXX., and the best known among them is one drawn up from the text of the Hexapla (q.v.; compare also ORIGEN), which it follows most slavishly, without any regard for Syriac idiom or grammar. It contains the critical marks of Origen, and is moreover furnished with numerous variants, fragments from other Greek versions, and exegetical scholia. Bishop Paulus of Tela is supposed to have composed it at the instigation of bishop Athanasius, 617 A.D. There are now only a few (imperfect) MSS. extant of it—one in Paris, one in the Ambrosian library (a third, once in the possession of Ts Masius, has disappeared), and further portions are found in the Nitrian collection in the British museum. The greater part of the Biblical books has been edited from it, but in separate publications. A complete edition is still a desideratum. An attempt is now being made toward a more complete edition of the Hexapla itself by a reconstruction of lost portions of the Greek, through the medium of the parallel Syriac passages preserved in this translation. Two other MSS. in the Paris library contain fragments of another Greco-Syriac version, by Jacob, bishop of Edessa, who, in 703 and 704 A.D., composed it from the Peshito and the above translation, which is probably to be understood in the sense of his having made a new recension of Paulus of Tela's work, corrected after the Peshito.

SYRIAN RITE, CHURCH OF, that portion of the oriental church which had its seat in Syria, and which was anciently comprehended in the patriarchate of Antioch, and (after that of Jerusalem obtained a distinct jurisdiction) in the patriarchate of Jerusalem. The Syrian church of the early centuries was exceedingly flourishing. Before the end of the 4th c., it numbered 119 distinct sees, with a Christian population of several millions. The first blow to the prosperity of the Syrian church was the fatal division which arose from the controversies on the incarnation. See MONOPHYSITES, NESTORIANS, EUTYCHES, JACOBITES. The Eutychian heresy, in one or other of its forms, obtained wide extension in Syria; and the usual results of division ensued in the corruption and decay of true religion. The Moslem conquest accelerated the ruin thus begun; and from the 7th c. downward, this once flourishing church declined into a weak and spiritless community, whose chief seat was in the mountains, and whose best security from oppression lay in the belief on the part of the conquerors of their utterly fallen and contemptible condition. Under the head MARONITES has been detailed the most remarkable incident in the later history of the Syrian church. This branch of the eastern Christianity, although for the most part divided from the orthodox Greek church by the profession of Monophysitism, took part with the Greeks in their separation from the w., under Michael Cerularius; and the reunion of the Maronites to Rome had the remarkable result of establishing side by side, within the narrow limits occupied by the Christians under the Moslem rule in Syria, two distinct communities, speaking the same language, using the same liturgy, and following the same rites; and yet subject to two different patriarchs, and mutually regarding each other as heretics and apostates from the ancient creed of their country.

The chief peculiarity of the Syrian rite, as contradistinguished from the Greek, consists in its liturgy, and the language of that liturgy, which is Syriac, and with which the people, and in many cases the priests, are entirely unacquainted. The liturgy is known as the liturgy of St. James. The Syrians agree with the Greeks in the use of leavened bread, in administering communion under both heads, in permitting the marriage of priests (provided they marry before ordination), and in administering the unction of confirmation at the same time with baptism even to infants.

The Christian community of Syria may at present be divided into four classes: the Maronites, the Greeks (who are also called Melchites), the Monophysites, who are called Jacobites, and the primitive Syrian Christians (not Maronites), who are in communion with Rome. This last-named community forms the small remnant of the ancient Syrian church, which remained orthodox during the controversy on the incarnation, at the time of the general lapse into Monophysitism. To these are to be added the Christians of the Latin rite and a few Protestants. The Maronites number about 160,000; the Greeks are said to be about 180,000; the Jacobites of Syria and of Armenia proper are said to

reckon together about 40,000 families, of whom, however, probably scarcely 10,000 can be set down to the account of the Syrian church. The non-Maronite Syrians who follow their national rite, but are in communion with Rome, are supposed to amount to about 5,000. The resident Latins are chiefly members of the religious orders who from immemorial time possess convents in the Holy Land, and European Catholics, who have settled permanently, or for a time, at Jerusalem, Beirût, and Damascus. None of these can in any way be regarded as belonging to the Syrian church. It may be well to add, that the belief, and in most particulars the disciplinary practice of these several classes coincide substantially with those respectively of the same communities in the other churches of the east. All (with the exception of the Maronites and the few united Syrians of the Greek communion reject the supremacy of the Roman see. The Syrians of the Greek communion reject the double procession of the Holy Ghost; and the Jacobites firmly maintain their old tenet of Eutychianism. Among them all are to be found monks and religious females. All enforced celibacy on their bishops, and refuse to priests the privilege of contracting a second marriage, or of marrying after ordination. The practice of fasting prevails among all alike. They receive and practice the invocation of saints and prayers for the dead, and the use of painted, although not of graven images. Many particulars regarding them are to be gleaned from the memoirs of recent missionaries of the several denominations, among which the letters published from time to time by the French society for the propagation of the faith, are particularly full. For the modern Nestorians, and the Syrian Christians of Travancore, see NESTORIANS.

SYRINGA, a genus of plants of the olive family (order *oleaceæ*). The English name of the genus is lilac (q.v.), and is derived from *lilac*, the Persian for flower. *Syringa vulgaris*, the common lilac, is a native of Persia, Hungary, and the borders of the Danube. Dr. Sibthorp found it wild on mount Hæmus, but not in Greece. It has been long cultivated by the Turks. It is one of the few shrubs that are not injured by the smoke of cities, and it flourishes in perfection in most of the squares of London. It grows very fast, from 20 to 36 in. every year. The Persian lilac, *S. Persica*, is a small shrub from 4 to 6 ft. high, and is one of the most ornamental of low deciduous shrubs. When planted in pots and forced, it may be made to flower at Christmas; but under the circumstances the flowers will lose their ordinary fragrance. There are three varieties of this species in the English nurseries. *S. Chinensis* is a native of China. It is intermediate between *S. vulgaris* and *S. Persica*. It grows vigorously to a height of from 10 to 12 ft. The *lilas de Marly* and *lilas Sangé* are varieties. *Syringa* is also a name improperly applied to the mock-orange or Philadelphus (q.v.).

SYRINGE (Gr. *syrix*, a pipe), a hydraulic instrument, consisting of a cylinder of metal or glass, having a conical nozzle at one end, and the other fitted with an air-tight piston. The nozzle being inserted in a liquid, the retraction of the piston draws the liquid into the cylinder, on the principle of the pump (q.v.), and by its forward pressure the liquid is expelled from the nozzle in the form of a jet.

SYRRHAPTÈS, a genus of birds of the grouse family (*tetraonidæ*), of which only one species is known (*S. Pallasii*), a native of the deserts of Tartary, abundant in the neighborhood of lake Baikal. From its peculiar characters, which led Pallas to call it *tetrao paradoxus*, it has received the somewhat pedantic name of *heteroclitæ grouse*. (A word is called *heteroclitæ* by grammarians which departs from the ordinary forms of declension.) The legs and toes are short, and densely feathered; and the toes are joined together for the greater part of their length. The bird walks with difficulty, but flies very well, although in general only for short distances. The wings and tail are very long, terminating in remarkably long, slender, pointed plumes.

SYRTIS MAJOR AND SYRTIS MINOR, the ancient name of two gulfs of the Mediterranean sea, on the n. coast of Africa. The former (now called the *gulf of Sidra*) lies between cape Mesurata, in Tripoli, and the table-lands of Barca, and forms the most southern part of the Mediterranean. The latter (now called the *gulf of Cubes*) lies to the n.w., between Tunis and Tripoli. The shores of both are inhospitable, and abound in quicksands, which, carried by the wind, are said by the ancients to have frequently overwhelmed ships, and the reports of modern travelers to some extent confirm these old traditions. Their waters are (or were) dangerous to sailors, on account of the shallows, sand-banks, and sunken rocks that abound in them. The name Syrtis is derived from an Arabic word *sart*, meaning a desert.

SYRUP, *sirup*, *sherbet*, and *shrub* are all derived from the Arabic *srb*; the first through the Latin, the second through the Persian, and the third through the Hindu. Syrup, in its simplest meaning, is a saturated solution of sugar boiled to prevent fermentation; but it also means the juice of fruits saturated with sugar and many flavored liquids, treated in the same way. Generally speaking, the finest refined sugar is used; and every effort is made to get the syrup very clear and free from all feculent matter. Syrups of fruits are much used on the continent to mingle with water for drink, and are very wholesome. They are also used in Britain, but not much, except in medicine—there being many medicinal syrups.

SYSTYLE, an arrangement of classic columns in which the intercolumniation is equal to twice the diameter of the column.

SYZRAN', a t. of central Russia, in the gov. of Simbirsk, on the right bank of the Volga, about 150 m. below the t. of Simbirsk. It owes its foundation to its advantageous commercial position on the Volga, and in the middle of a district teeming with agricultural produce. From the wharfs of Syzran, 150 vessels, laden with corn, are annually dispatched to Rybinsk and St. Petersburg. Pop. '67, 19,279.

SZABADKA. See *THERESIOPEL*, *ante*.

SZABOLCS, a co. in n.e. Hungary, bounded on the n. by the Theiss river, about 2,300 sq.m.; pop. '70, 265,584. The surface is level, with large areas of marsh. The soil is sandy, but fertile. The principal productions are corn, cattle, and wine. Capital, Nagy-Kálló.

SZAR VAS, a t. of Hungary, in the co. of Bekes, in a plain on the Kőrös, 22 m. n.e. from Csongrad. It has a considerable trade in corn and cattle. Pop. '69, 22,446.

SZATMAR', or **SZATHMAR'**, a co. in n.e. Hungary, s. of the river Theiss, drained by the Szamos river; about 2,250 sq.m.; pop. '70, 280,563. The surface is level, except in the east, where it is mountainous. There is a large area of marsh. The soil is fertile. The principal productions are corn, hemp, flax, tobacco, and wines. The inhabitants are mostly Magyars. Capital, Szatmár.

SZATHMAR-NEMETHY, a t. of Hungary, on the Samos, 60 m. n.e. of Debreczin; pop. '69, 18,353.

SZECHENYI, ISTVÁN, Count, 1792-1860; b. Vienna, of a noble and wealthy Hungarian family. He served in the Austrian army in the wars with Napoleon, and afterward traveled through Europe. Clearly seeing the great need for reform and advance in the material and social status of the Hungarian people, he gave liberally of both time and money in bringing this about. Among his acts were the endowment of the Hungarian academy; the founding of a society for improvement in horse-breeding, a most important occupation in Hungary; and the establishment of schools of acting and music. To his exertions were due the erection of the great suspension bridge between Pesth and Ofen, the removal of obstacles to navigation at the "Iron Gates," and the introduction of steamboats on the Danube. He became minister of public works. He opposed the revolutionary measures of Kossuth, and when the revolution of 1848 broke out, became insane, and though he recovered, continued to reside at the Döbling asylum, where he committed suicide after a domiciliary visit by the Austrian police.

SZE-CHUEN (Four streams), a vast province of western China, and the largest of the 18. It has an area four times greater than that of England, but the population is scanty. The Kincha-Kiang, or "Golden sanded river," which rises in the southern slopes of the great Tibetan range, flows through Sze-chuen, and after receiving several tributaries, it becomes, before leaving the province, the famous Yang-tse-Kiang. In its course, it passes at right angles and by narrow gorges, through a succession of ranges of hills, which have a direction from n. to south. The people of Sze-chuen cannot always force a subsistence from their stubborn soil. Famines are not uncommon, when whole families are starved to death, and thousands subsist on a mixture of rice, roots, and common earth. Coal is abundant, but of inferior quality; seams of from 3 to 5 feet in thickness are laid bare in the gorges cut by the Yang-tse, and gold is found in small quantities.

SZEGEDIN, till lately the second largest t. in Hungary, but almost completely destroyed by a terrible flood in Mar., 1879. In this hardly paralleled catastrophe, of the 7,000 houses of the city, only 350 were left standing. The ruin to property was immense; the loss of life was given at 2,000. Szegedin stands (or stood) on the low ground where the Theiss is joined by the Maros, 118 m. s.e. of Buda-Pesth. In its normal condition, it manufactures great quantities of soda, tobacco, coarse cloth, etc., has the largest wharfs on the Theiss, and carries on an extensive river-trade in wood and corn with Transylvania. Its markets rank next to those of Pesth and Debreczin. Pop. '69, 70,179.

SZEGSZARD, a t. of Hungary, near the right bank of the Danube, 80 m. s.s.w. of Pesth. Here excellent red wine is made. Pop. '69, 11,069.

SZENTA. See *ZENTA*.

SZENTES', a market t. of Hungary, 30 m. n. of Szegedin, near the left bank of the Theiss. The commune contains (1869) 27,653 inhabitants, who are chiefly engaged in the wine culture.

SZOLNOK, a co. in Hungary, bounded on the s.e. by Transylvania, within which it was formerly included, drained by the affluents of the Szamos river, about 850 sq.m.; pop. '76, 113,639. The surface is mountainous and well wooded. The soil in the valleys is fertile. The principal productions are corn, rye, oats, tobacco, and wines. The inhabitants are mostly Wallachians. Capital, Szilágy-Somyló.

SZOLNOK', a t. of Hungary, on the Theiss, 66 m. e.s.e. of Pesth. It contains important salt magazines, and is the center of the traffic by steamers on the Theiss, and an important railway station. Pop. '69, 15,847.

T

T, THE twentieth letter of the English alphabet, is the sharp or mute of the lingual series, *t, d, th (dh)*. It is produced by pressing the fore-part of the tongue against the front of the palate. The name in Shemitic (*Tau*) signifies a mark (in the form of a cross.) The Shemitic tongues had another *t*-sound, which became the Greek *ϑ (th)*. This aspirated *t* is wanting in Latin and its derivatives; it is also foreign to high-German, although the Gothic and other low-German tongues (English) possess it. The Gothic *th* has become in high-German *d*. In the *spelling* of high-German, *th* occurs not unfrequently; but it is never pronounced, and the introduction of it being considered by students of the language an aberration, there is a tendency to drop the *h*. There is evidence that in Latin, at an early period, *t* before *i* was sibilated so as to sound like *ts* or *z*. See letter C. Before *s*, *t* was frequently dropped; as *fons* for *fontes*, *sors* for *sortes*. Final *t* was in Latin pronounced but faintly, and inscriptions show that in popular speech it was often dropped; e.g., *fecit* for *fecit*, *vixit* for *vixit*. Thus the modern Romanic languages have inherited the loss of the pronominal ending *t* from their common mother. In French, *t* between two vowels has been elided; as *père mère*, from *pater, mater*. In the corresponding words of the allied languages, *t* is often interchanged with other letters. T in Sanskrit, Greek, and Latin becomes *th* in Gothic and English, and *d* in high-German; thus Lat. *tres* (Sans. *trayas*), Goth. *thrais*, Eng. *three*, Ger. *drei*; Lat. *tectum* (Gr. *tegos*), Goth. *thak*, Eng. *thatch* or *thack*, Ger. *dach*; Lat. *frater*, Goth. *brothar*, Eng. *brother*, Ger. *bruder*. In German, the *t* of the English is often represented by *z*, as Eng. *two* = Ger. *zwei*; Eng. *toll* = Ger. *zoll*; while German *t* or *th* becomes Eng. *d*, as Ger. *tag*, *thau* = Eng. *day*, *deu*. A more remarkable interchange is seen in Lat. *jaerina* = Eng. *tear*. See PHILOLOGY.

TABASCO, a state in s.e. Mexico; 'bounded on the n. by the gulf of Mexico, on the e. by Campeachy, on the s. by Chiapas and Guatemala, and on the n. by Vera Cruz; drained by the Tabasco, the Usumasinta, and other streams; about 12,500 sq. m.; pop. '71, 88,707. The surface is mostly low and level, with a large area of marsh. The climate is very hot and unhealthful. Mahogany and other valuable woods abound. The principal productions are rice, tobacco, coffee, sugar-cane, pepper, indigo, and honey. Capital, San Juan Battista.

TABANIDÆ, a numerous family of dipterous insects, of the section *proboscidea*, which live by sucking the blood of horses, oxen, and other animals, and are popularly known by the name of GAD-FLY, which, however, is often given also to some of the *æstridæ* (see BOR). The insects called cleg (q.v.) are of this family. The proboscis is exerted, and is generally terminated by two lips; the palpi are also exerted; the antennæ are three-jointed, the third joint consisting of a number of rings. The tabanidæ fly with a buzzing noise. They are very annoying to cattle in the end of spring and early part of summer; and where they abound, the skins of cattle are often streaked with blood from their bites. The LARGE GAD-FLY (*T. bovinus*) is more common in some parts of the continent of Europe than anywhere in Britain, and is rarer in Scotland than in England. But the British tabanidæ are numerous. The species are widely distributed. Some of them inhabit the deserts of Arabia and Africa, and attack camels in prodigious numbers.

TABARD (Fr. *tabarre* from *tabardum*, low Lat.), a military garment in general use in the latter half of the 15th and beginning of the 16th c., which succeeded the *Jupon* and *Cyclas*. It fitted closely to the body, was open at the sides, had wide sleeves or flaps reaching to the elbow, and displayed the armorial ensigns of the wearer on the back and front, as well as on the sleeves. About the middle of the 16th c., the tabard ceased to be used except by the officers at arms, who have down to the present time continued to wear tabards embroidered with the arms of the sovereign.

TABASHEER, a substance sometimes found in the cavities or tubular parts of the stems of bamboos and other large grasses. It consists chiefly of silica, with a little lime and vegetable matter, or sometimes of silica and potash, in the proportions of about 70 parts of silica and 30 of potash. It appears to be formed by extravasation of the juices of the plant, in consequence of some diseased condition of the nodes or joints. It is in high repute among the Hindus as a tonic, and is prepared by imperfect calcination and trituration. The powder is often chewed with betel, in order to renovate the constitution. There are several varieties of tabasheer, one of which, of very rare occurrence, is extremely beautiful, of a delicate azure color by reflected light, and of a faint yellowish hue by transmitted light, easily crushed between the fingers, and of "an aerial and unsubstantial texture, which we look for in vain in any other solid." Other varieties are yellowish, white, and much like some varieties of opal. Tabasheer is very porous, and absorbs water and oil very rapidly; effervescence taking place when it is plunged in water. By absorption of oil, the opaque varieties become transparent. When the greater part of the oil is expelled by heat, the structure of the tabasheer becomes apparent; it is beautifully veined, the veins being sometimes parallel, and sometimes curved.

The optical properties of tabasheer are remarkable. Of all known substances, it has the lowest refractive power.

TABBY, or **TABBYING**, another name for watering fabrics. See **MOIRE**. It is usually applied to stuffs or worsted cloths instead of silks.

TABERNACLE (Heb. *Ohel Moed* = tent of meeting, *seil.*, between God and man; **LXX.** *Skene*, Vulg. *Tabernaculum Foderis*), or, more fully, "tabernacle of the congregation," was the tent first erected by Moses in the desert as a visible symbol of the divine Presence in the midst of the people. It was the place where he went to receive his inspirations as their representative when they "came to seek Jehovah." A cloudy pillar descended and stood at the door of the tabernacle while "the Lord spake to Moses." The detailed description of the tabernacle contained in Ex. xxv. seqq., xxxvi. seqq., renders more than a brief outline superfluous in this place. Suffice it to mention that it was divided into the "sanctuary" proper—which formed the front part, and the dimensions of which were 20 cubits in length, 10 in width, and 10 in height—and the "holy of holies," which was 10 cubits square and 10 high. A kind of court-yard, formed by curtains suspended between columns, ran round the tabernacle, 100 cubits long and 50 wide. The entrance was toward the east—the rising of the sun—and closed by another costly curtain, into which, like unto the first covering, figures of "cherubim" were woven. The surrounding court was much larger on this eastern than on the western side, for here it was that the people assembled for the purpose of worship. Here also stood the altar, made of acacia-wood, upon which a perpetual fire was kept burning, and the brazen laver. The *sanctuary* contained the gilded table with the showbread to the right, the golden candlestick with the seven branches to the left, and between both the "golden altar," or the "altar of incense," upon which the high-priest burned incense in the morning and evening. In the holy of holies, the holy ark, or ark of the covenant, alone was kept; a box of acacia-wood, plated with pure gold both in and outside, containing the two tables of the Ten Commandments. On the top of it were the two cherubim, their faces turned toward each other; and between them there was the symbolical presence of Jehovah (the Shechinah), to which Moses appealed for guidance.

Only once a year, on the Day of Atonement, the high-priest was allowed to enter the holy of holies, while the sanctuary was the ordinary place of the priests, and the court that of the Levites. The tribe of Levi was also that to which the place nearest to the tabernacle, around which the 12 tribes were grouped, was assigned, as it also was the duty of its members to convey the building from place to place during the migrations.

The tabernacle, after the people had settled in Canaan, was erected at Shiloh, where it was still found at the time of Saul, although the ark of the covenant itself had been carried away by the Philistines, in the time of Eli, and when restored, placed at Kirjath-jearim. Nor was the tabernacle of Shiloh the only sanctuary, as it was intended to be. We find other local sanctuaries with priests—at Bethel, Nob, Sichem, Mizpah, etc.—at which even Samuel worshipped, as in legally instituted places. When David is reported to have removed the ark from Kirjath-jearim to Jerusalem, nothing is said about the tabernacle of Shiloh; on the contrary, David erected a new one on purpose for the ark. It seems probable that it was removed at some time or other from Shiloh to Nob, and thence to Gibeon, from whence Solomon seems to have fetched it away, with all its vessels, thus putting an end to the double worship that under David had divided the faithful between Gibeon, where Zadok officiated, and Jerusalem with Asaph's worship. Nothing is further known of the tabernacle, which, besides being a symbol of God's presence, had also served the purpose of a visible political and religious link between the tribes. As a safeguard against idolatry and unlimited sacrificial worship, however, it did not prove effective enough.

TABERNACLE, (Lat. *tabernaculum*, *armarium*), in the Roman Catholic church, is the name given to the receptacle in which the consecrated elements of the Eucharist are retained. The name is derived by analogy from the tabernacle of the old law, and in form the Roman Catholic tabernacle bears a general resemblance to the Jewish original. By the present discipline, the tabernacle is commonly a small structure of marble, metal, or wood, placed at the posterior part of the altar, and of costly material and workmanship. Even when the exterior structure is of marble or metal, there is commonly an inner receptacle of wood (properly cedar), lined with silk. The tabernacle is appropriated exclusively to the reservation of the Eucharist, and it is prohibited to keep within it any other object, however sacred, as the chrism, relics of saints, the altar vessels, etc. A lamp is constantly kept burning before the tabernacle, which is ordered to be kept at all times carefully locked, the key being retained by the clergy, to whom it is forbidden to intrust it to any lay person, even the sacristan or other official of the church.

TABERNACLES, FEAST OF (Heb. *Succoth*, **LXX.** *Heorte skenon*, Vulg. *Feria tabernaculorum*), a Hebrew feast of seven days' duration, beginning on the fifteenth day of the seventh month (Tishri), and instituted principally in memory of the nomad life of the people in the desert, and the booths or tents used on their march. Besides this signification, it also had an agricultural one, like the other two pilgrimage festivals, the passah and the feast of weeks. It was emphatically the feast of "ingathering"—i.e., the close of the labors of the field—the harvest of all the fruits, of the corn, the wine, and

the oil. During this feast, the great bulk of the people were enjoined to dwell in booths, which we learn from Nehemiah viii. 15, were made of olive, pine, myrtle, palm, and other branches, and were erected on the roofs of houses, and in the courts and streets. The scriptural injunction, to take trees and "boughs of goodly branches of palm trees," etc., was by tradition explained to mean a bunch made of palm, myrtle, and willow branches, and the esog-fruit, a species of citron which the faithful carried in procession during these seven days in the temple; while those who did not visit the temple only said a benediction over it on the first day. The Sadducees and Karaites, however, demurred to this explanation, taking the passage merely to refer to the construction of the booths. Special sacrifices, and a greater number of burnt-offerings than on any other festival, were offered up on this; and on it also the law was to be read to the people every seventh year. It was emphatically called *the* festival, and was the most joyous of them all. There was especially, during the time of the temple, the "joy of the liberation," consisting of the priest's fetching, during the morning sacrifice of each day, water from the well of Siloah, and pouring it out, with the accompaniment of music and hymns. There was further a grand illumination in the evening in the court of women, which is said to have lighted up the whole city of Jerusalem; and during and after which, dancing and singing took place. On each day the trumpets were sounded 21 times. At the end of the seven days' joy, an eighth day of solemn rest was celebrated, which was perfectly distinct from the other days both in its sacrifices and in its general service. The bunch was laid aside, the booths were relinquished, and a sin offering—in expiation of transgressions that might have taken place during the hilarity of the previous feast-days—was slaughtered.

Three distinct times we find the inauguration of the temple celebrated on this important festival, by Solomon, Ezra, and Judas Maccabæus, although with regard to the festival itself it would seem from Nehemiah viii. 17, that it never had been properly celebrated before the exile. The observances of the booths and the harvest-bunches are still in force with the strict adherents of traditional Judaism, although the agricultural signification of the festival to them can only be a historical or poetical reminiscence. It has been well observed of old, that no festival could have been more apt to inculcate the fundamental principle of Judaism—viz., the equality of all men, than this, which enjoined that every one should live for a time in primitive dwellings, without distinction of rank, or station, or fortune, and should rejoice in the fruits of the last harvest on the hallowed spot, together with the whole people of the land, "before the Lord."

TABERNÆMONTANA. See COW-TREE and FORBIDDEN FRUIT.

TABES DORSALIS, an affection of the nervous system, now known in medicine as *locomotor ataxy*. Tabes dorsalis was so named by Romberg of Berlin; but Dr. Todd of London in 1847 first recognized its true nature, and specially insisted on the distinctions to be drawn between tabes dorsalis and *paraplegia* (see PARALYSIS). The name of *locomotor ataxy* was first applied to the affection by Dr. Duchenne of Paris. It is characterized by a want of power in harmonizing the action of certain muscles, the absence of such co-ordinating power being first apparent in the lower extremities, and the gait in consequence being straggling and unsteady. True paralysis is absent, but sensibility is diminished, and neuralgic pains are present in the legs and feet. The loss of power progresses, and the later stages of the malady are marked by such symptoms as disordered vision, incontinence of urine, and exhaustion. The duration of this disease varies. It may run its course in a few months, or be prolonged over years. The *etiology* or *causes* of tabes dorsalis are still obscure. Mr. Lockhart Clarke has shown that a peculiar change in the posterior columns of the spinal cord, and in the posterior or sensory roots of the spinal nerves, accompanies this disease. Prolonged exposure to cold and damp, drunkenness, sexual excesses, masturbation, and like causes have been credited with inducing the disease. It is alleged to be more common in males than in females, and subjects between the ages of 30 and 50 are said to suffer most frequently from its attack. The characteristic movements in tabes dorsalis are worthy of note. The patient has an unsteady gait, and walks like a drunken person, but soon recovers his bearing in some degree. A difficulty in carrying out the intents of the will is experienced, and in picking up an object one hand is employed to steady the other. When the eyes are shut, the patient walks with extreme difficulty. Tabes dorsalis may be distinguished from disease of the cerebellum by the absence of the characteristic pain at the back of the head, and vomiting. The *prognosis* of tabes dorsalis is very unfavorable. Its progress may be retarded, but the prospect of ultimate cure is well nigh hopeless. The *treatment*, as may readily be understood, is limited to the improvement of the general health, rather than to any specific remedies. Warm clothing, nutritious food, and rest are the chief items in the course of treatment prescribed for this disease; while opiates are indicated for the relief of the neuralgic pains. Sulphur baths have been prescribed in the earlier stages to relieve the numbness, and attention requires to be paid to the bowels with a view of alleviating constipation.

TABINET, a rich kind of cloth, chiefly used for window-curtains. It consists of a warp of silk and a weft of wool-yarn, of the same kind as that used in making poplin. It has the appearance of a fine damask, and is usually enriched with diaper patterns.

TABLEAUX VIVANTS (i.e., living pictures), representations of works of painting and sculpture, or of scenes from history or fiction, by living persons. They are said to have been invented by Mme. de Genlis, when she had charge of the education of the children of the duke of Orleans. They have long been common in theaters, and have more recently become an amusement of private circles. In an æsthetic point of view, they are of no value whatever, but rather are of injurious influence, and contrary to just principles of taste.

TABLE-LANDS, or **PLATEAUS**, are extensive plains at a considerable elevation above the sea, whose boundaries are either ranges of mountains much higher on the side away from than on the side next to the table-lands; or steep acclivities, sloping from the level of the plateaus to the surrounding country. They are often traversed by mountain chains, and occasionally even lose the character of plains altogether, being mere conglomerations of hills. The chief table-lands are in Europe, central Spain; in America, the Oregon territory, the great salt plain of Utah, the north and center of Brazil; in Africa, the interior of Barbary; while in Asia, almost the whole of the south and center of the continent consists of plateaus, which rise terrace above terrace till they culminate in that of Thibet. Of the Asiatic plateaus, the principal are: that of Asia Minor (3,280 ft. above sea-level), Armenia (7,000 ft.), Persia or Iran (3,000 ft.), Mysore (4,000–5,000 ft.), Deccan (1500–2,000 ft.), Thibet (12,000–17,000 ft.), and Chinese Tartary (3,000–4,300 ft.). These table-lands are generally accounted for by the supposition of a more extensive and uniform action of the upheaving force than that which produced mountains; and satisfactory indications of the former action being quite recent, and long subsequent to the latter, are occasionally discovered.

TABLE-MONEY is an allowance granted to general-officers in the army, and flag-officers in the navy, to enable them to fulfill the duties of hospitality within their respective commands. It varies according to the locality or importance of the appointment, £3 3s. a day being the maximum, except under very unusual circumstances.

TABLE MOUNT. See CAPE TOWN.

TABLES, **LUNAR**, are tabular lists of the values of the elements of the moon's orbit, as planetary tables are those of the elements of the planets' paths; but the term is also occasionally employed to denote the tabulated angular distances of the moon from certain stars at fixed epochs, as given in the *Nautical Almanac* (q.v.). See **LATITUDE**.

TABLE-TURNING. See **ANIMAL MAGNETISM**; **SPIRITUALISM**.

TABOR, a celebrated mountain of northern Palestine, rising solitarily in the north-eastern part of the plain of Esdraëlön, to about the height of 1000 ft. and commanding the most extensive and probably the most magnificent prospect in the Holy Land. Eastward, the eye catches a gleam of the waters of the Galilean sea, 15 m. distant; while the whole picturesque outline of its deep-sunken basin, of the rolling trans-Jordanic plateau, and the course of the sacred river itself, is clearly traceable; westward, stretch away into the dim horizon the rich plains of Galilee, rising up into the dark-green ridges of Carmel, overhanging the Levant; on the north and north-east, the snow covered heights of Hermon (see **LEBANON**) glitter pale over the intervening hills; while to the south, the view embraces the fatal heights of Gilboa and the confused landscapes of Samaria. Tabor itself is at present thickly clad with forests of oak, pistacias, etc., the haunt of wolves, wild-boars, lynxes, and various kinds of reptiles. Its beauty alone would be sufficient to insure it distinguished mention among the mountains of Palestine, but it owes its celebrity even more to its having been regarded from an early period as the mount of Transfiguration. This opinion, however, is now all but universally abandoned, as there is strong evidence of its summit having been then occupied by a city; and travelers are disposed to look for the scene of this supernatural incident further north, in the neighborhood of Hermon. In the times of the crusaders, Tabor was studded with churches and monasteries, relics of which, as well as of Roman and Saracenic structures, still remain.

TABOR, a small drum, played with one stick, in combination with a fife. It was formerly used in war, but has now given place to the kettle-drum.

TABORITES (a sect of the Hussites in Bohemia), derived their name from their fortress of Tabor, near the river Luschnitz, an affluent of the Moldau, 49 m. s.s.e. of Prague. There is now a small town at the place, which has a population of 6,717, and carries on some wollen manufactures, etc.—The first leader of the Taborites was John Ziska (q.v.) of Trocnów. Under him was Nicolas von Hussinecz, who repelled the imperial army from Tabor in 1420. The Calixtines, desirous of the peace of the country, offered the throne of Bohemia first to king Ladislas of Poland, then to the grand duke Witold of Lithuania, and afterward to his brother Coribut. Ziska refused his consent, and thus these parties became completely separated. In the years 1420 and 1421 both of them set forth their creed in a number of articles. The Taborites absolutely rejected all ordinances of the church not expressly appointed in the holy Scriptures. Both parties were united by common danger in opposition to a common enemy. In 1422 Ziska defeated the imperialists at Deutschbrot, and thereafter with uninterrupted success in a number of minor conflicts; and in 1424 Prague was saved from destruction only by submitting to hard terms of peace. After Ziska's death, Procop (q.v.) the

greater, or Procop rasa (the shaver), and Procop the less were the leaders. In 1427 and in 1431 they gained great victories at Miess and Tachau over the mercenary crusaders of the German empire, and till 1432 their incursions were the dread of the neighboring countries. The council of Basel, finding them still unconquered in 1433, proceeded to treat with them; and the Calixtines entered into an arrangement, known as the *Prague compact*, which, however, was despised by the Taborites and the Orphans, as that section of the Taborites who considered Ziska as irreplaceable, had come to be termed. The Taborites and Orphans were completely defeated at Böhmischbrot on May 30, 1434, by the now united forces of the Roman Catholics and the Calixtines. In the treaty of Iglau in 1436, the emperor Sigismund confirmed the compact, and promised religious and political liberty. The civil war, however, continued till king Ladislas in the diet at Kutenberg, in 1485, established a religious peace, securing both Roman Catholics and Calixtines in their possessions. The Taborites were eventually lost in the sect of Bohemian Brethren (q.v.), which arose from among them.

TABRIZ (pronounced and frequently written *Tabreez*), a great and ancient city of Persia, capital of the province of Azerbaijan, 40 m. e. of lake Urmiah, and on the Aji, which flows s.w. into that lake. The town is surrounded by a ditch and a brick wall, pierced by 7 gates. It forms an oblong of gardens and houses, 2½ m. long; stands 4,000 ft. above sea-level, but nevertheless has the appearance of being shut in by mountains. The streets are broader and cleaner than in most eastern cities, but they are flanked as usual by the pits from which the earth required for their houses was taken; the houses are infested with noxious insects; and the bazaars are roofed with sticks, and are dark and dirty. Water, however, is comparatively plentiful. The chief buildings of Tabriz are not specially striking. Perhaps the principal architectural feature of the town is the fine ruin, Kabūd Masjid, or "blue mosque," about 300 years old, and in part covered with blue tiles beautifully arabesqued. The citadel is a spacious edifice of burned brick, the walls of which, however, have been cracked in many places by earthquakes. Tabriz is the seat of a varied industry, in which leather and silk manufactures, and gold and silver smith's work alone are of importance; recently it has also become the emporium of an extensive trade, the exact value of which, however, is not known, owing to the careless manner in which the custom-house officials transact their business, and to the prevalence of smuggling. Merchandise, to the value £400,000 is exported through the regular channels from Tabriz to Russia; but it is estimated that in 1859 a quantity of equal value was conveyed to that country by smugglers. Since 1859 this illicit traffic has very much diminished, although it still exists along the whole Russo-Persian frontier of Azerbaijan. The chief imports are cotton fabrics, sugar, woolen cloth, and wines and spirits. The chief exports are cotton cloths (originally from England), drugs and spices, dried fruits, shawls, carpets, and raw silk. The commerce of 1877-78 was very small, mainly on account of the Russo-Turkish war, which arrested the trade between Trebizond and Tabriz. The imports were in that year valued at £525,500, the exports at only £270,000; while in 1873-74 the collective trade amounted to over £7,100,000. The Anglo-Indian telegraph line passes through the city.

Tabriz, the ancient *Tauris*, became the capital of Tiridates III., king of Armenia, in 297 A.D., and was probably at that time an old city. In 791 A.D. it was enlarged and greatly embellished by Zobeidah, the wife of Harūn-al-Rashid. In 858, and again in 1041, the city was devastated by an earthquake. It was taken and sacked by Timur in 1392, and was soon after seized by the Turkomans, from whom it was taken by the Persians in 1500. In 1721 it was again visited by a dreadful earthquake, and on this occasion 80,000 persons are said to have perished. It has been several times in the hands of the Turks, but was finally taken from them by Nadir shah in 1730. Tabriz is a city of Turks, and Turkish is the language spoken. Pop. variously estimated at 110,000 to 180,000.—Eastwick's *Three Years' Residence in Persia* (Lond. 1864), and *Commercial Reports from Her Majesty's Consuls* (1878).

TABU, **TAPU**, or **TAMBU**, a Polynesian term, denoting an institution found everywhere, and always essentially the same, in the Polynesian islands and in New Zealand. Its primary meanings seem to be exactly the same as those of the Hebrew *to'ebah*. This word, like the Greek *anathema*, the Latin *sacer*, and the French *sacre* (and the corresponding and similar terms in most languages), has a double meaning—a good sense and a bad; it signifies on the one hand, sacred, consecrated; on the other hand, accursed, abominable, unholy. It results from a thing being held sacred, that certain acts are forbidden with reference to it, and from any act being deemed abominable, that it is forbidden; a notion of prohibition thus attaches to the word tabu, and this is in many cases, the most prominent notion connected with it. The term is often used substantively in the sense of a prohibition, a prohibitory commandment. If a burial ground has been consecrated, it is tabu; to fight in it is then an act sacrilegious and prohibited, and this also is tabu; moreover, those persons are tabu who have violated its sanctity by fighting in it, and they are, loosely and popularly, said to have broken the tabu. This example illustrates all the uses of the word. It has furnished to the English language the now familiar phrase of being "tabooed" = forbidden.

The extent to which, among the Polynesians and New Zealanders, things and acts are tabu, must appear almost incredible to Europeans unaware of the facts of savage life.

Without much detail, it is impossible to convey any idea of it. The prohibitions, however, divide into two classes: one consisting of traditional rules, binding upon all, acting through religious terror equally upon chiefs and people; the other, of prohibitions imposed from time to time, obviously with the view of maintaining or extending the authority of the chiefs. Those of the first class are by far the most remarkable. Of the most important of them—those bearing upon what are called sacred things, those relating to the person of the chief, and those relating to intercourse between relatives—a few examples may be given.

Any house or piece of ground consecrated to a god is tabu, and thus affords an inviolable shelter to men fleeing from an enemy. *A fortiori*, all temples are tabu. To sit upon or to touch the threshold of a temple is tabu to all except chiefs of the first order, the lesser chiefs may stride over the threshold, but common persons pass over it on their hands and knees. It is tabu to eat the plant or animal believed to be the shrine of one's tutelary god. To come in the way of a funeral procession is severely tabu, for it is believed that the gods accompany the procession; if any person were to disregard the warning chant of the mourners, they would rush at him and put him to death. Again, to touch the person of a chief is tabu to his inferiors; also, to touch anything belonging to him, to eat in his presence, to eat anything he has touched, or to mention his name. And a chief's threshold is as sacred as that of a temple, and must be passed over in the same manner. It is strictly tabu to touch a dead chief or anything which belonged to him, or any of the clothes or utensils employed in his interment; even those employed in laying out the body pay the penalty of infringing this prohibition. The interdiction upon family intercourse varies in extent in different places. In the Tonga islands it was tabu to mention the name of father, mother, father-in-law, mother-in-law; also to touch these relatives, to eat in their presence (unless with the back turned, when constructively the person was not in their presence), or to eat anything which they had touched. In the Fiji islands, generally, it is tabu for brother and sister, first cousins, father-in-law and son-in-law, mother-in-law and daughter-in-law, brother-in-law and sister-in-law, to speak together, or to eat from the same dish. Husband and wife, too, are forbidden to eat from the same dish. In some places a father may not speak to his son after he has passed his 15th year. In an immense number of cases, equally extraordinary, the tabu is used to enforce the prevailing ideas of social propriety. It interferes with cooking, eating, dressing, speaking; scarcely anything is too minute to be regulated by it.

The traditional tabu also supplies to some extent the place of laws and a police. In many places exposed property of some kinds is always under its shelter. In some cases it appears to have been worked in the interest of the priests; thus, certain foods—for example, turtle—are always tabu, and cannot be eaten until a portion has been set aside for the gods. There is a purely superstitious use of it, too, in relation to common things, as when a canoe is made tabu that it may go more safely.

The chiefs have a large discretionary power of declaring articles or actions tabu; indeed, their power is unlimited, but they are expected to keep within precedent. In many cases they use it for purely public purposes—thus, when a feast is coming on they lay a tabu upon pigs and nuts, and other articles, that there may be abundance for the feast. And when a scarcity of anything is apprehended they place a temporary tabu on its use. Speaking generally, any article of food—fish, flesh, fowl, grain, or fruit—may be rendered tabu. A coast, a river, a hunting ground, may be declared tabu; and then there is an end of fishing, and sailing, and hunting, until the chief has withdrawn the prohibition. The tabu is obviously a powerful instrument of government; and the chiefs are very adroit in using it for their own advantage.

When a man has accidentally infringed the tabu against touching a chief, or a relative, or things immediately connected with him, he is freed from the state of tabu by a ceremony called *moë-moë*; this consists in pressing, first the palms, then the back of the hands, to a superior chief's foot, and afterward washing the hands with water. If a man has accidentally eaten food which a relative or chief has left, he goes through a ceremony called *fola*, which consists in pressing a superior chief's foot against the stomach. Any breach of the laws relating to sacred places must be atoned for by sacrificing to the offended god. A person, when he is tabu, must not use his hands in feeding himself or in working; were he to feed himself, it is believed that he would die; he must be fed by others until the tabu is removed. In many cases the tabu can only be removed by time. Thus, a common person, who has touched a dead chief, remains tabu for ten lunar months; a chief for four or five months, more or less, according to the deceased's superiority over him. In several cases breach of tabu is punished with death; in many, it involves a sort of outlawry—the neighbors of the offender being free to carry off or to destroy his goods.

It is obvious that the effect of breaking a tabu—at any rate, one effect of it—is to produce uncleanness. The offender has done something unholy, accursed; his hands are not clean; if he has not sinned in the last degree he must make atonement or undergo purification. The chief, holding a divinely appointed rank, recognized as a semi-divine person, descended from the gods, is the medium of purification; he has authority to loose as well as to bind. The offense consists in a thing having been done displeasing to the supernatural powers, for which, it is believed, they will not fail to take

vengeance. It is not, in the general case, an offense against any particular god; nor is the punishment of it looked for from one god more than from another. Tabu is certainly older than most of the Polynesian gods; it must have existed for ages before the mythologies took their present shapes; it might have existed before any name for god had become current. It has no connection with fetishism. The Polynesians do not worship natural objects; their belief that certain plants and animals are the shrines of gods would naturally lead to the worship of those; but, in fact, they merely do not eat the plant or animal which is the shrine of their tutelary god. And though this is enforced by a tabu, the tabu is evidently distinct from the belief in the god's connection with the plant or animal; it is only the means of enforcing that belief—being the customary means used to prevent any act which would provoke a god to anger. The origin of tabu seems to be a vague fear of superhuman powers; this has become associated with certain things and acts; thus practically, tabu is a system of divinely appointed restraints—religion, in the primary sense of the word. The religious horror has attached itself—or, through the policy of priests and rulers, has become attached—to every prohibition supported by a strong expediency; which it is apt to do among rude peoples, especially where the prohibition relates to the family, or to the relation of tribesmen to their chief. It must have been through a long process of construction, carried on by the governing classes—the chiefs and the priests—that tabu became the system it now is. The extensive political application of tabu is sufficient evidence that the Polynesian chiefs have been adepts in the art of turning the religious feelings of their countrymen to their own account.

TACHOUT is the name given in Algiers by the Arabs to the small gall formed on the tamarisk tree, *tamariscus indica*. Since the discovery of photography these galls have become of considerable importance as a source of gallic acid, of which they contain a large proportion. The French chemists import considerable quantities; and the same gall, under the name of mahee, is imported for the same purpose by British chemists from India.

TACAMAHAG, or **TACAMAHACA**, a name which, from the number of its applications, has produced considerable confusion in the history of commercial products. No less than four different resins are known under this designation. One, from Mauritius, is obtained from a tree common in India and its islands, called the poon-wood tree, *calophyllum inophyllum*. Another, from South America and the West Indies, is obtained from *zanthoxylum (jugosa) octandra*—this is usually called shell tacamahac. A third, also from South America, is yielded by a tree called *iceia tacamahuca*; it is supposed to be the Mexican copal. And the fourth is from North America, and is the produce of the Carolina or tacamahac poplar; it is collected in small quantities, and has only a small value for supposed medicinal properties. The others are chiefly used for varnishes.

TACCA, a genus of plants of a small natural order called *taccaceæ* nearly allied to *araceæ*. They are large perennials, with tuberous roots. The species are few, and are found in maritime places and woods in the South Sea islands and the warmest parts of Asia and Africa. Some of them (*T. pinnatifida*, etc.) are much cultivated for the sake of their tubers, which are used as an article of food, although they are acrid, and require maceration in water to remove their acidity, on account of which also they are generally eaten with vinegar, or some acid substance. They contain a large quantity of starch, which is wholesome and nutritious, and is imported into Britain as a substitute for West Indian arrow-root. It is known as *Tuhiti arrow-root*. Dr. Seemann says that it is an effectual cure for dysentery, which other arrow-root is not. The boiled leaf-stalks of the plants of this genus are also used in China and Cochin-China as an article of food.

TACHÉ, ALEXANDRE, b. Lower Canada, 1812; educated at St. Hyacinthe college, joined himself to the order of the Immaculate Conception, and in 1823 was ordained at the St. Boniface post of the Red River mission. From this point he traveled great distances toward the n.w. and in Manitoba. In 1853 he succeeded bishop Provencher, to whom he had previously been coadjutor, and in 1871 he became metropolitan. Archbishop Taché was the founder of the St. Boniface theological college, and has written books on the subject of his missionary labors in the north-west.

TACIT RELOCATION, in the law of Scotland, is a phrase borrowed from the Roman law, signifying that when a tenant continues in possession of the lands after his lease or term has ended, there is an implied or tacit renewal of the lease, whereby he continues bound to pay the same rent and observe the same stipulations. The same doctrine exists in English law, though the above phrase is not used.

TACITURNITY, in the law of Scotland, is a mode of extinguishing an obligation by mere silence, and making no claim upon it within a long time. It is a distinct ground, and embraces a shorter period than the ordinary prescription of limitation (q.v.); for if a creditor never apply for payment or performance of the obligation, a presumption arises either that there never was such an obligation, or that he has abandoned it. Much depends on the circumstances of each case whether such a doctrine is applicable; and, as a general rule, the periods of prescription are adopted as superseding the common law doctrine of taciturnity.

TACITUS, CAIUS CORNELIUS, the historian. Of his parentage, or of the time and place of his birth, we can only conjecture that his father was probably Cornelius Tacitus, a Roman eques, who is mentioned as a procurator in Gallia Belgica, and who died in 79. From the emperors Vespasian, Titus, and Domitian he received promotion and other marks of favor; and in 78 he married the daughter of Caius Julius Agricola. In 88, when Domitian was emperor and Tacitus prætor, he assisted as one of the quindecimviri at the celebration of the *Ludi seculares*. Agricola died in Rome in 83, while Tacitus and his wife were absent; and nothing further is known of the historian till 97, when, in the reign of Nerva, he was appointed consul suffectus, succeeding Tacitus Virginius Rufus, whose funeral oration he delivered. Tacitus had already attained distinction as an orator when the younger Pliny was entering upon public life; and both of them were appointed, in Nerva's reign in 99, to conduct the prosecution of Marius, then proconsul of Africa. Tacitus became one of the most intimate friends of Pliny, of whose letters 11 are addressed to him. The time of Tacitus's death is unknown, but he most probably survived Trajan, who died in 117. His extant works are: (1) *Vita Agricole*, written after the death of Domitian in 96, and universally admired as a masterpiece of noble sentiment and pregnant epigram. (2) *Historiæ*, written after Nerva's death in 98, and before the *Annales*, and embracing the period from the second consulship of Galba in 68 to the death of Domitian in 96. Only the first four books have reached us in a perfect state, but there must have been many more. (3) *Annales*, commencing with the death of Augustus in 14, and closing with the death of Nero in 68. These also have reached us only in an imperfect state. (4) *De Moribus et Populis Germaniæ*. This treatise is trustworthy only as regards those Germans who were best known to the Romans from their proximity to the Rhine. For the provinces beyond that river it has no value, whether geographical or political. (5) *Dialogus de Oratoribus*, if the work of Tacitus at all, must be his earliest. Tacitus is one of the greatest of historians. In love of truth and integrity of purpose he is equalled by few; in conciseness of phrase and power of saying much and implying more in one or two strokes of expression he is rivalled by none. The best editions are those of Orelli and Halm.

TACITUS, MARCUS CLAUDIUS, about 200–76, A. D.; b. Interamna (modern Terni), in Umbria; elected emperor after the death of Aurelian and an interregnum of seven months. He began his brief reign of 200 days at the advanced age of 75 years; one of the oldest and wealthiest of the senators. He instituted needful reforms in relation to the coinage and the morals of his subjects; being himself of temperate habit, upright, and honest; giving liberally to the state from his private fortune, and living as simply after his accession to the throne as in private life. He claimed descent from the historian Tacitus, whose works he ordered preserved with care in the public libraries, and copies made every year. He favored the restoration of the power of the senate. His victory over the Scythians is recorded on his coins by the inscription "Victoria Gothi" and "Victoria Pontica." He died at Tyana, some say of a fever, others by assassination.

TACK, the Scottish law-term, synonymous with lease (q.v.).

TACK—TACKING. The *tack of a sail* is the lower windward corner. The *tack* is the rope employed in hauling down that corner to its proper position. The *tack of a fore-and-aft sail* is its lower forward clue or corner; it also designates the rope for hauling down that corner. A ship is said to be on the *starboard* or *port tack* when she is close-hauled, with the wind on the starboard or port side.

Tacking is the practice of beating up against an adverse wind by a zigzag course. If a vessel at A require to sail due n. to B, and if the wind be either n., or from any point n. of the line CAD, it is obvious that the wind will not carry her directly to her destination. As an extreme case, let the wind be n. or dead against her. By setting her sails obliquely, as at A, it will be possible to beat up in the direction AE. If the master consider that at E he has passed sufficiently from his straight course to B, he will then put his helm a-lee, which brings the ship's head straight to the wind, the tacks of the sails being at the same time set free. The after-sails are then smartly braced over to the opposite side, and the ship's head falls off from the wind in an opposite direction to that previously held, until the course is EF. This process is repeated on each side of the line AB, until at length the ship makes her port, B. The length of each tack, as EF, is called a *board*. When the wind is straight ahead, as in the above example, the several boards should obviously be equally on each side of the line AB. If, however, the wind were not so direct, it would be necessary that the boards in one direction should be shorter than those in the other. Sometimes, from the nature of the channel, as an estuary, etc., it is necessary to take a long tack one way, say to starboard, and a very short one to port. This is known as

"sailing with a long and a short leg."

TACKING OF MORTGAGES, in the law of England, is a practice that sometimes occurs in the course of mortgage securities, when one person acquires more than one mortgage over the same estate. Thus, though mortgages, according to the general rule, rank according to the order of date, yet, if a third mortgagee, who became so without notice of a second incumbrance, purchase the first mortgage even after notice of the second mortgage, so as to require a legal title, and if he holds them both in his own right, he can tack the one to the other, and so obtain priority for the third mortgage over the second mortgage. This is on account of an old technicality, scarcely intelligible to other than lawyers.

TACONIC MOUNTAINS, in the co. of Berkshire, w. Mass., and the co. of Bennington, Vt.; running n. and s. on the e. boundary of New York, uniting the Green mountains of w. Massachusetts with the Highlands of the Hudson. They were named from the characteristic strata of the range, a kind of rock (believed to be older than the Silurian system) to which prof. Emmons gave the name of taconic; attaining a thickness of 30,000 ft. along the Appalachian chain. The formation in various portions consists of slates, sandstones, quartzites, limestones, and iron ore. The highest peak in Vermont is mount Equinox, 2 m. w. of Manchester, 3,872 ft. above the sea; in Massachusetts, mount Greylock, near North Adams, 3,505 ft. in altitude, is the highest elevation in the state.

TACONIC SYSTEM, an extensive series of rocks in the United States, described by Dr. Emmons. They consist of two divisions, the upper having a thickness of 25,000 ft., and containing lower Silurian fossils; and the lower, with 5,000 ft. of thickness, in which, as yet, no fossils have been found, but which is generally considered to be the equivalent of the Cambrian rocks of Britain.

TACTICS, MILITARY. Strategy (q.v.) is the art of maneuvering armies with reference to the objects of the whole campaign—the securing of communications, the cutting off an enemy from his base, throwing him into a position where he must fight at a disadvantage, or surrender, etc. Tactics has regard to the evolutions of an army in the actual presence of an enemy. It is the strategy of the battle field; the science of maneuvering and combining those military units which drill, discipline, and the regimental system have brought to the perfection of machines. It was admirably described by Napoleon as *the art of being the stronger*—that is, of bringing an overwhelming force to bear on any given point, whatever may be the relative strength of the entire armies opposed.

The earliest records of battles are those of mere single combats, in which the chiefs, fighting either on foot or in chariots, performed great deeds; and the commonalty, who apparently were without discipline, were held in profound contempt. With the growth of democracy arose the organization of the phalanx (q.v.), the advance of which was irresistible; and its firmness equally so, if charged in front. It, however, changed front with great difficulty; was much deranged by broken ground; and failed entirely in a pursuit, or if attacked in flank. Far lighter, and more mobile, was the Roman legion (q.v.). Among Roman tactics was also the admirable intrenchment, which they scarcely ever omitted as an additional source of strength for their position.

“Events reproduce themselves in cycles;” and with the decay of Roman civilization came again the mail-clad heroes and cavaliers—mounted this time on horses—who monopolized the honors of battle, while the undisciplined footmen had an undue share of the dangers. Later in the feudal period, this disparity between knight and footmen was diminished by the employment of bodies of archers, whose shafts carried distant death. The adoption of gunpowder for small-arms altogether neutralized the superiority of the armored knight. This change brought infantry into the front place in battle, and threw cavalry into the status of an auxiliary. The French revolutionary wars tended much to the development of artillery as a field-weapon, and Napoleon employed this terrible engine to its fullest extent, a practice followed by the best modern generals, who never risk a man where a cannon-ball can do the work. Frederick the great was considered an innovator for fighting with infantry four deep. During the French war, the formation of three deep became general, and still obtains in several European armies. Before the battle of Waterloo, the British leaders had acquired sufficient confidence in their troops to marshal them in a double line. It is doubtful whether the advance in arms of precision will not soon necessitate the formation in a single line, or even in a single line in open order.

It is impossible, in an elementary article of this character, to give even an approach to an essay on modern tactics, which is an intricate science. We can only notice briefly a few of the more important principles.

First, as to the art of being the stronger, which is undoubtedly the highest recommendation in a general, we may cite the example of the battle of Rivoli. In 1796, Napoleon was besieging Mantua with a small force, while a very much smaller army operated as an army of observation. The Austrian commander had collected at Trent a force powerful enough to crush completely the French army, with which he was marching south. Parallel with his course lay the lake of Garda, and to prevent the enemy escaping up one side, as he marched down the other, the Austrian leader divided his army into two powerful corps, and marched one down each side of the lake. The

instant the young French gen. knew of this division, he abandoned the siege of Mantua, collected every available man, and marched against one body of the enemy. Though far inferior on the whole, he was thus superior at the point of attack, and the victory of Rivoli decided virtually the whole campaign. This corresponded in principle with Napoleon's general plan in battle. He formed his attack into column, tried to break through the center of the enemy's line; and if he succeeded, then doubled back to one side, so as to concentrate the whole of his own force against one half of the enemy's, which was usually routed before the other half of the line could come up to the rescue.

Taken collectively the tactics of the three arms may be thus summarized: The infantry form the line of battle, and probably decide the day by a general advance over the enemy's ground. The cavalry seek to break the opposing infantry by frequent charges in front, or on any flank which may be left exposed. If a part of the line wavers, a charge of horse should complete the disarray. When the rout commences the cavalry should turn it by furious onslaught into utter discomfiture. The province of the artillery is to canonade any portion of the line where men are massed, or where a charge is about to be made; to demoralize cavalry, and generally to carry destruction wherever it can best disconcert the enemy.

Adverting now very briefly to the tactics of the several arms individually, we have—

Infantry.—This force has four formations—skirmishers, line, column, and square. The skirmishers precede and flank an advancing line or column, picking off the enemy, whose masses offer good mark, while their own extended order gives them comparative impunity. If resistance be encountered in force, the skirmishers retreat behind their massed supports. The line is a double or treble line of men, firing or charging. For musketry purposes it is the most formidable formation, and is the favorite British tactic in every case where the officers can depend on the steadiness of their men. For bursting through a line the deep column is the most effective. It is the favorite French formation, and during the revolutionary and Napoleonic wars, the British and Russians alone succeeded in resisting it. At Vimiera the 50th regiment, 700 strong, stood in line: it was attacked by a column of 2,000 French. The English col. threw back his left (which was the end attacked), and advanced his right, delivered a volley at point-blank range, charged the column in flank, and utterly routed it before the French could deploy into line to resist the onslaught. The column is, therefore, the best formation on a march; the line, when in actual collision with the enemy. The formation in Echelon (q. v.) to a great extent combines these advantages. See SQUARE.

Cavalry.—The function of heavy cavalry is limited to the charge in line. The light cavalry form in small sections, to scour the country, collect supplies, and cut off stragglers.

Artillery.—No distinct tactics exist for this arm beyond the fact that a concentrated fire is vastly the most effective, and that the artillery should always have a support of infantry at hand, to protect it from a sudden incursion of hostile cavalry.

Tactics of position depend on the moral energy of the commander-in-chief. Few would dare, as Cæsar did, an invasion in which there was no retreat, if defeated. It is a military maxim not to fight with the rear on a river, unless many bridges be provided for retreat, in case of disaster. A convex front is better than a concave front, because internal communication is more easy. The flank should be protected by cavalry, or preferably by natural obstacles. In battle a long march from one position to another, which exposes the flank to the enemy, is a fatal error. By such the French won Austerlitz, and lost Talavera. In a pursuit a parallel line is better than the immediate route the retreating enemy has taken, as supplies will be more readily procured, and he may by celerity be attacked in flank. This was strikingly exemplified in the Russian pursuit of Napoleon's army retreating from Moscow.

TACTICS, NAVAL. With the advent of steam, iron-plated ships, and rams, the tactics under which Rodney and Nelson fought and conquered have passed away, while the principles of the new warfare have scarcely been sufficiently established for reduction to theory. A glance at the obsolete tactics of bygone times must, therefore, suffice in the present article.

In ancient naval engagements, where the vessels fought on the comparatively smooth waters of the Mediterranean, and where the use of oars rendered the commanders nearly independent of the wind, the attack consisted of a charge with the beaked prows, followed, if that failed, by the use of balistæ and a hand-to-hand struggle. See NAVIES, ANCIENT. The introduction of gunpowder, with broadside ordnance, necessitated a change, and the great desideratum of each admiral was to present as long a line of broadsides as possible to the enemy, to take care that none of his ships was masked by the intervention of another between it and the foe, and to endeavor in each ship to oppose its broadside to the bow or stern of a hostile ship, so as to obtain the preponderance of force, and to rake his decks. The ships of two decks and upward formed the line of battle, while frigates and smaller vessels served as look-outs and skirmishers. A fleet in one line would, however, have been of inconvenient length for sailing, and it was usual to sail in three, six, or nine parallel lines while traversing the ocean, the ships of the rear lines tacking into their places in the line of battle on the signal to form for

action. The great principle of maneuvering was to get the weather-gage, i.e., to be to windward of the enemy, both for facility of navigation, and because the smoke would inconvenience him most. The standing attempt during the French war was to double the enemy's line (see CLERK, JOHN, of Eldin) by piercing it, or passing it at the van or rear, and then, by tacking in its rear, to place his ships between two fires. This was first practiced in lord Rodney's action of 1782, and was successfully repeated by Nelson at the battle of the Nile. Under steam, and with ships carrying colossal ordnance, naval tactics have entirely changed. It used to be the object to avoid being raked; it is now to avoid being hit at all. The projectiles used are so tremendous that a few hits involve destruction. Ships are consequently constructed so as to offer the least mark to ordnance; and with the same view they are kept constantly in rapid motion. Actions are fought, not, as in old time, within pistol-shot, but at a mile or two miles' distance. The loss of life is less; for the battle is no longer decided hand-to-hand by the cutlass and the boarding-pike, following a furious cannonade; but after a few long shots with ponderous missiles, one or other vessel becomes disabled, and being helpless, yields the victory to her foe. The ships will be steamed end on if they act as rams, and also to offer less mark to shot. Rival fleets have never yet met on a large scale to fight under the conditions of modern war.

TADEMA, LAWRENCE ALMA, a distinguished painter, b. Jan. 8, 1836, at Dronryp in the Netherlands. He was educated at Antwerp, but early settled in London, where he was naturalized as an English subject in 1873. His numerous and very popular paintings deal chiefly with antique classical and Egyptian subjects, which, under Tadema's handling, have a very vivid air of reality. "How they amused themselves in Egypt 3,000 years ago" (1863) is one of Tadema's earlier paintings; "A Sculptor's Model" (1878), one of his last. Tadema is an A.R.A., and a member of various foreign academies; he is a chevalier of the legion of honor, and a knight of several orders.

TADMOR. See PALMYRA.

TADPOLE. See FROG.

TAEL, a money of account in China, is equivalent to about 6s. 8d. sterling, or to a thousand of their sole coin, the "ts'een," tchen, or "cash."

TENIA AND TENIADÆ. See TAPEWORM.

TAE-PINGS, the name given to the Chinese rebels who made their appearance in 1850, and (see CHINESE EMPIRE) desolated some of the best cultivated provinces of China. After the war of 1860 it became the interest of the English, French, and American governments to re-establish order in China. The repulse of the rebels at Shanghai in Aug., 1860 had been followed by several engagements between them and the imperialists, in which the Tae-pings were defeated, mainly in consequence of the re-organization of the imperial army by Ward, an American. In the beginning of 1862 the Tae-pings again advanced on Shanghai, and were twice defeated. In that year Ward was killed; and "Ward's force," handed over to an English officer, took the name of Gordon's brigade. Permission was also granted to capt. Sherard Osborne to organize in England a small fleet of gun-boats, to ascend the Chinese rivers and re-establish order. Gordon's brigade rendered essential service to the imperial government. The rebels were defeated in upward of 16 engagements; and in 1864 almost every important city was taken from them. Capt. Sherard Osborne's expedition was less successful. He found that the jealousy of Chinese officials would not permit him to take the steps necessary to discharge properly the duty he had undertaken, and he therefore threw up his commission, and returned to England. The conduct of the imperial authorities at Su-chow, where a horrible massacre took place, led to the withdrawal of the English military force; but the rebellion had been effectually checked. They were finally dispersed in April, 1865, when they were routed by the imperial army at Kia-ying-chou in Kwantung. In the same year, the Nienfei, or marauders of the north, began to be troublesome. This was a marauding expedition, without political significance, organized by restless spirits among farmers who had been ruined by the overflowing of the Yellow river, the repair of the embankments of which had been neglected on account of the confusion and expense of the Tae-ping rebellion. The last show of active warfare made by a body of Nienfei was in the beginning of 1866, when, joined by some imperialist regiments whose pay was in arrear, they threatened Hankow; and would have attacked the European settlement but for the arrival of some English gun-boats. The malcontent imperialists were easily brought back to allegiance, and the marauders were dispersed, and have not been authentically heard of since.

The Mohammedans of the n.w. of China give the imperial government trouble from time to time. Their risings are often on political grounds, and they are on this account apt to be confounded with the annihilated Tae-pings. See PANTHAYS.

TAFFETA (or Taffeta), a term of somewhat general application in silk-mercery. It was formerly applied to all plain silks simply woven by regular alternations of the warp and weft, and is by some writers supposed to be the first kind of silk-weaving known even to the Chinese, from whom it came to us. Modifications have, however, been introduced, by varying the quality of the warp and weft, and by the substitution of various colors for the single one of the original taffeta. It has therefore become a sort of

generic term for *plain silk*, gros de Naples, gros des Indes, shot or chameleon silk, glacé, and many others, and even for some combinations of silk, wool, and other materials.

TAFFRAIL, in a ship, is the rail over the heads of the stern-timbers, extending across the stern from one quarter-stanchion to another.

TA FIA, a name used in the sugar-producing colonies for a kind of rum distilled from molasses. The term is only in general use in French colonies.

TAFILET', (or Tafilet), one of the four territorial divisions of Morocco (q.v.).

TAGANROG', an important sea-port of Russia, in the gov. of Etkaterinoslav, on the n. shore of the sea of Azov, 20 m. n.w. of the chief mouth of the Don. It was founded by Peter the great in 1696, was lost to Russia from 1712 till 1774, when it again reverted to the people who founded it, and since that time it has increased in importance yearly. The port of Taganrog is so shallow that large ships cannot approach within half a mile of the quay, and at this distance from shore they load and unload by the help of barges. The harbor is wholly unprotected. Owing to its position on the shore of a very fertile country, it is able to export wheat in large quantities (1,050,156 quarters being exported in 1872), as well as linseed, hempseed, skins, wool, butter, iron, copper, and Russian leather. Of these articles, the last four are obtained from the governments of Perm and Orenburg, and are exported chiefly to Turkey, Greece, and Italy. In 1864, 1664 vessels, of upward of 350,000 tons, entered and cleared the port; and the exports for 1873 amounted to 28,797,839 roubles, or about £4,560,000; the imports chiefly wine, agricultural implements, and machinery, tea, fruits, and porter, amounted to 8,048,663 roubles, or about £1,273,500. Pop. '67, 25,027.

TAGLIONI, MARIE, a celebrated *danseuse*, b. at Stockholm, April 23, 1809, of Italian parents, her father (Filippo Taglioni, b. at Milan, 1777) having been successively ballet-master at several opera-houses in different parts of the continent. Mlle. Taglioni made her *début* in Paris in 1827, where she created a perfect *furor*, and was at once recognized as the first of ballet-dancers. Her success was equally great at most of the other European capitals, London included. She retired from the stage in 1847, and after ward resided in Italy and in London, where she taught dancing and deportment.

TAGUS (Span. *Tajo*), the largest river of the Spanish peninsula, rises on the frontier of New Castile and Aragon, between the Sierra de Albarracín and the Sierra de Molina, about 45 m. n.e. of the city of Cuenca. It first flows n.w. for about 30 m. to its union with the Gallo, at which point it curves to the s.w., and flows in that direction to Toledo, whence it flows w. to Abrantes in Portugal. From Abrantes the river flows s.w., and passing Lisbon, enters the Atlantic about 10 m. lower down. At Peralejos, a few m. from its source, it is 1 ft. deep, 15 paces broad, and confined between rocky walls 400 ft. high. At the city of Toledo, it breaks through a romantic rocky pass, the walls of which are upward of 200 ft. high. From Villavellia, 18 m. within the Portuguese border, the Tagus is navigable to its mouth, a distance of 115 miles. Above Lisbon, the river widens like an estuary, being in some places 5 m. broad; opposite Lisbon, however, it is only 1 m. broad. The principal affluents are the Jarama, Guadarrama, Alberche, Alagon, and Zezere from the n. and the Guadiela and Rio del Monte from the south. Total length, 540 miles.

TAHI TI, or OTAHEITE, the chief of the Society islands (q.v.), is 32 m. long, about 120 m. in circumference, and consists of two peninsulas, connected by an isthmus about 3 m. broad, but which is submerged at high water. Pop. 13,800, of whom more than 13,000 are natives. The chief town is Papiete, with a safe harbor, a patent slip for vessels of 400 tons, and careening quays. For the trade, history, etc. of Tahiti, see SOCIETY ISLANDS.

TAH'LEQUAH, a t. and capital of the Cherokee nation, Indian territory, lying in the valley of the Illinois river, 12 or 15 m. e. of the Missouri, Kansas and Texas railroad. Pop. estimated at 3,000. The civilization of the Indian residents is high, and the place is of great interest as showing what may be done in the education of our aborigines. The t. has schools and a church, a newspaper, printed in both the Cherokee and English tongues, and a capitol erected at a cost of \$20,000.

TAIKO SAMA (the name by which Hidéyoshi Toyotomi is best known to English speaking people); 1536-93; b. in the province of Owari, Japan, of humble parents; when still a boy became a retainer of Nobunaga, and rose to be a general of commanding military genius. He avenged the murder of Nobunaga, humbled Satsuma, and reduced the warring clans to submission. Having tranquilized the native empire, he found employment for his restless armies in invading Corea in 1592. He sent Konishi and Kato into the peninsula with 80,000 men, who in a few weeks entered the capital, overran the eight provinces, and met and defeated the hosts of the Chinese sent to succor the Coreans. Having been in 1586 made regent, he retired in favor of his son in 1591, and hence took the title of taiko (*samur* meaning lord, or sir). He greatly patronized art, stimulated by personal favor the porcelain manufacture, and many other industries, encouraged commerce, and internal national improvement. Compelled to act with a high hand between the rival sects of the Jesuits and Dominicans, and to regulate the foreign relations of Japan, he shipped the European friars from the country, and when they re-

turned, had them hanged. The "age of Taiko" is looked upon with admiration by the Japanese, and his life has been many times written in well-illustrated books, his adventures being standard subjects of Japanese decorative art. His last words, like those of Napoleon, were an order to his troops. On his death the victorious soldiers were recalled from Corea. His successor, Iyeyasu, whose genius gave peace to the empire for over 260 years, followed in the main the policy of Taiko.

TAIL, ESTATE, is, in English law, an estate given to A and the heirs of his body, or A and the heirs-male of his body, or some other class of heirs less extensive than the class of heirs-at-law. It was anciently a question whether in such a case A, the father, could defeat the right of the children, and break the entail. In England, it was early decided that A could, by a sham process, called a fine or recovery (q.v.) break the entail; while in Scotland it was otherwise, at least since 1685, the Scotch legislature having legalized a mode of securing the entail, and preventing A, or any of his successors, from breaking it. See **ENTAIL**.

TAILOR-BIRD, *Orthotomus*, a genus of birds of the family *sylviadæ* (q.v.), with a long graduated tail, the feathers of which are narrow. The species are numerous, natives of the East Indies and of the Indian Archipelago, and haunt cultivated grounds, where they are commonly seen in pairs. Their flight is rapid and undulating, and they seldom ascend above the lower branches of trees. The name *tailor-bird* is derived from the way in which the nest is formed. Two leaves are taken at the extremity of a twig, and are sewed together by their edges, or a large leaf is sewed together; the necessary holes being made by the bill, and vegetable fibers forming the thread. Within the hollow thus made, a quantity of a cottony substance is placed to receive the eggs.

TAILZIE, the ancient term in the law of Scotland to denote a deed creating an entailed estate. See **ENTAIL**.

TAIN, a royal, parliamentary, and municipal burgh in the county of Ross and Cromarty, on the south shore of the Dornoch firth, and 24 miles n.n.e. of Inverness. There is no proper harbor. The most interesting building is a small ruined chapel, remarkably rude and simple in architecture, and said to date from the 13th c.; and there is also a collegiate church, founded in 1471, and an endowed academy incorporated by royal charter. Brewing and iron-founding are carried on. Pop. of royal burgh (1871) 2,287.

TAINE, HIPPOLYTE ADOLPHE, a French critic, was born at Vouziers in Ardennes, April 21, 1828, and studied at Paris, where in 1853 he obtained the diploma of *docteur ès lettres*, for two essays, *De Personâ Platoniciâ*, and *Essai sur les Fables de Lafontaine*. They were followed by his *Essai sur Tite Live* (1854), crowned by the French academy; *Les Philosophes Français du dix-neuvième Siècle* (Paris, 1856); *Essai de Critique et d'Histoire* (Paris, 1857); *Histoire de la Littérature Anglaise* (Paris, 1864); *Philosophie de l'Art* (1865; Eng. transl.); *Notes sur l'Angleterre* (1871; Eng. transl.); and others. In the *Littérature Anglaise* (Eng. transl., Edinburgh, 1872), the author surveys and criticises our whole literature from a point of view which is conceived to be rigorously scientific. According to Taine, there are three things to be borne in mind when writing the history of a nation's literature: first, the *race* to which the nation belongs; second, its *position* both geographical and in civilization in the different phases of its literary development; and third, the *period* or duration of these. Under this view, the history of literature assumes the character of a psychological problem. Among Taine's recent works is *Les Origines de la France Contemporaine*, of which the first installment, *L'Ancien Régime*, appeared in 1875 (Eng. transl., 1876). In this the writer gives a graphic account of the social disease that led to the French revolution. A picture of the revolutionary age itself followed in *La Révolution* (vol. i. 1878). The new régime is afterward to be described. Taine was elected a member of the academy in 1878.

TAIRA, or **HEI**, the name of a celebrated family of Japanese nobles, who with their rivals, the Minamots, kept the empire in turmoil during two centuries. Like the wars of the Roses in England, the war of the red and white banners in Japan ended only when one family was almost annihilated. The Taira house was founded by Takamochi, a great-grandson of the mikado Kuammu who reigned, 782-805. His descendants were for two centuries the military vassals of the emperor. Kiyomori, who became premier, 1167, was virtually ruler of Japan, his daughter being empress, his grandson mikado, and 60 of his relatives holding the highest offices at court, and their lands covering thirty provinces. At the height of their power, the long feud with their rivals, the Minamots, broke out in implacable enmity, 1156. In 1184, after suffering the loss of several bloody battles, driven from Kioto, and from castle to castle, they were slain or imprisoned to the last man, except a few exiles, as the result of the great naval battle of Shimonoséki, and the young mikado Antoku was drowned. In 1870, after 700 years of seclusion, the remnant of the Taira exiles were discovered in a remote mountainous district in Higo, island of Kiushiu. They number 500 souls, and subsist by hunting.

TAIT, ARCHIBALD CAMPBELL, D.D., LL.D.; b. Edinburgh. 1811; educated at the university of Edinburgh and Oxford, becoming afterward a public examiner of the latter; succeeded Dr. Arnold as head-master of Rugby, 1842-50; was made dean of Carlisle, 1850; bishop of London, 1856; archbishop of Canterbury, 1868. He is known as a

prominent opponent of the Tractarians or Puseyites. He has published *The Dangers and Safeguards of Modern Theology*; *The Word of God and the Ground of Faith*; and a volume of sermons.

TAIT, PETER GUTHRIE, b. England, 1825; graduate of Cambridge, fellow of St. Peter's college; prof. of mathematics in Queen's college, Belfast; prof. of natural philosophy in the university of Edinburgh, 1862. Associated with W. J. Steele he published *A Treatise on Dynamics of a Particle* (1856); *Elementary Treatise on Natural Philosophy*, with sir Wm. Thomson, fellow of St. Peter's college (1867). He has been associated with prof. Balfour Stewart in some publications. He published *Thermodynamics* (1868).

TAI-YUAN, a city of China, in the province of Shan-si, on the Fuen-ho, an affluent of the Hoang-ho, 250 m. s.w. of Peking. It is said to be about ten miles in circumference, fortified and populous. Porcelain, iron wares, and carpets are manufactured.

TAI-WAN-FOO, the capital of the island of Formosa (q.v.), on a large plain 3 m. from the s.w. coast, with a pop. of 120,000. It is a large straggling town, contains many park-like spaces with fine trees and green lanes, and is surrounded by a high battlemented wall, six miles in extent. Its chief edifices are the residences of the mandarins, and the temples. The harbor of Tai-wan-foo, at Amping, is only a shallow open roadstead; trade is carried on only in five months of the year, cargo having to be carried in native boats. The chief export is sugar, which is grown all over the plain of Formosa; also rattan canes. About 27 m. to the s. is the harbor of Takao, the headquarters of the customs staff; it is better than that of Amping. See a "Description of Formosa" in the *Geographical Magazine* of 1877.

TALAVE'RA DE LA REY'NA, a t. of Spain, in New Castile, in the modern province of Toledo, is charmingly situated on the Tagus, 75 m. s.w. of Madrid. It is ancient, straggling, dirty, and inconvenient, is surrounded by interesting old walls, and abounds in antique picturesque fragments. It was formerly a flourishing town; but of its manufactures, only that of silk is now carried on. Fruits are extensively produced in the vicinity. Here, on July 27 and 28, 1809, sir Arthur Wellesley, with 19,000 English and German troops, and about 34,000 Spaniards, who, however, with very trifling exceptions, were not engaged, defeated upward of 50,000 veteran French troops, under Joseph Bonaparte and marshals Jourdan and Victor. Pop. 7,000.

TALBOT, perhaps originally a name equivalent to blood-hound (q.v.), but afterward applied to a race of hounds, now extinct, or nearly so, which seem to have been kept for show rather than for use. The talbot was of pure white color, with large head, very broad muzzle, long pendulous ears, and rough-hair on the belly. The white St. Hubert dog was either the talbot or a nearly allied breed. The talbot is the badge of the ancient house of Shrewsbury (surname Talbot), and the crest of some of the princely houses of Germany.

TALBOT, a co. in w. Georgia, having the Flint river for its n.e. boundary; drained by Uptoi creek; 350 sq.m.; pop. '80, 14,115—14,102 of American birth, 9,667 colored. It is intersected in the s. by the South-eastern railroad. The surface is hilly with a large proportion woodland. The soil produces grain and sweet potatoes, and is susceptible of much higher cultivation. Live stock is raised. It has grist mills and cotton gin works. Co. seat, Talbotton.

TALBOT, a co. in e. Maryland, having the Chesapeake bay on the w., the Choptank river on the s. and s.e.; drained also by Tuckahoe creek; 250 sq.m.; pop. '80, 19,065—18,759 of American birth, 7,327 colored. It is intersected by the Delaware and Chesapeake Bay railroad. It includes Poplar and Tilghman's islands, and the w. portion is nearly separated from the main-land by a navigable inlet. The surface is level and divided in nearly equal proportions into forests and plain. The soil produces large crops of grain, and live stock is raised. Manufactures of lumber, iron, carriages, and wagons, clothing and shipping are the principal industries. It has an important trade in oysters. Co. seat, Easton.

TALBOT, JAMES, LL.D., Baron Talbot de Malahide, b. Ireland, 1805; educated at Trinity college, Cambridge; member of parliament for Athlone in the liberal interest, 1832, defeated in 1835. He succeeded to his father's title in 1850; was created peer of the United Kingdom, 1856. He is president of the archaeological society of Great Britain and Ireland. He occupies a similar position in relation to the geological and zoological societies of Dublin; and resigned the office of president of the council of the royal Irish academy, 1869. He is the author of a monograph of the house of Talbot, including the senior branch, the head of which is the earl of Shrewsbury.

TALBOT, JOHN, was rector of Fretherne, England; chaplain of the centurion in which the missionaries of the Gospel propagation society came to America, 1702; founder and first rector of St. Mary's church, Burlington, N. J., 1703; for many years a leader of the church of England in the American colonies; consecrated bishop by non-jurors in England, 1722.

TALBOT, MATTHEW, b. England in the middle of the 18th century. He published *An Analysis of the Holy Bible, containing the whole of the Old and New Testaments*

collected and arranged systematically in 30 Books, which are subdivided into 285 Chapters and 4,144 Sections. This was republished in the United States by the rev. Dr. Nathaniel West, which was revised under the title of *The New and Complete Analysis of the Holy Bible* by the Rev. R. D. Hitchcock.

TALBOT, SILAS, 1750-1813; b. R. I.; present at the siege of Boston during the revolutionary war as capt. in a regt. from his state; brev. maj. by congress, 1776, for skillful work in New York harbor against the British fleet. He was wounded at fort Mifflin, 1777, but remained on the field till the fight was over. In the following year he assisted gen. Sullivan by transporting the American forces from the main-land to Rhode Island; brevet lieut. col. for the brilliant exploit of capturing the British floating battery *Pigot*, 22 guns, anchored in one of the channels threatening Newport. In 1779 on a cruise off the New England coast, with his prize and the sloop *Argo*, 10 guns, he captured *The Lively*, 12 guns, and 2 letters-of-marque, *The King George*, and *The Dragon*; was made brevet capt. in the navy, 1779, for taking *The Dragon* after a four hours' battle. He was taken in 1780 by the British and imprisoned in the Jersey prison; exchanged the following year. At the close of the war he bought the confiscated property of sir William Johnson near the Mohawk river; was representative to the assembly for several years; member of congress, 1793-94. The frigate *Constitution* (Old Ironsides) was built under his supervision, and in 1799 was his flag-ship during a cruise in the West Indies. He resigned 1801, and passed the rest of his life in New York.

TALBOT, WILLIAM HENRY FOX, celebrated in connection with photography, was the son of William D. Talbot of Locock Abbey, Wilts, and was b. in 1800. He was educated at Harrow, and afterward at Trinity college, Cambridge, where he took his degree with honors, and obtained the junior chancellor's medal in 1821. In the first parliament summoned after the passing of the reform bill, Talbot sat for Chippingham; but scientific investigation being more to his taste, he gave up politics, and devoted himself to the problem of fixing shadows, ignorant at the time of what had been effected in this department by Wedgwood and Davy. Step by step he discovered for himself a method of obtaining and fixing sun-pictures, and on the dissemination of a report as to Daguerre's successes in the same field, secured his just rights by publishing a paper (*Phil. Mag.*, Mar., 1839), in which the successive steps of his investigation and their result were detailed. See PHOTOGRAPHY. This process, by which a *negative* (q.v.) was primarily obtained, was subsequently improved by his invention (patent dated Feb. 8, 1841) of the calotype (q.v.) process. Soon afterward he obtained fresh patents, for an "instantaneous process" (which seems to have well deserved the name, as by it a legible picture was obtained of a printed bill fastened to the rim of a wheel revolving 200 times per second), a mode of "photographic engraving," and a "polyglottic process." A later invention of his, patented in 1858, was called by him photoglyphic engraving; see the art. PHOTOGRAPHIC ENGRAVING. In 1842, Talbot obtained the medal of the royal society for his previous discoveries. Latterly he devoted himself to the study of general physics, and to philological and miscellaneous researches. He died Sept. 17, 1877. Among his works are *Hermes, or Classical and Antiquarian Researches; Legendary Tales; Illustrations of the Antiquity of the Book of Genesis*; and a work on *English Etymologies*.

TALBOTYPE, a photographic process, called by the inventor, Mr. Fox Talbot, the calotype process (q.v.). Its essential features consist in the production in the camera of an image by light on the surface of chemically prepared paper, and this distinguishes it from other paper processes, and by consequence from other photographic processes.

TALC, a mineral allied to mica (q.v.), and, like it, easily separated into very thin flakes, which are transparent and flexible, but not elastic, like those of mica. Talc is composed almost entirely of silica and magnesia, in the proportions of 57-63 silica, and 30-35 magnesia, with 2-6 water. Its colors are silvery white, greenish white, and green. It has a pearly or semi-metallic luster, and is unctuous to the touch, in which it differs from mica. It occurs crystallized, generally in hexagonal tables, or in long prisms: the primary form is a rhomboid. It is also found massive, in beds chiefly in micaceous schists, gneiss, and serpentine.—A kind called *indurated talc*, or *talc slate*, has a curved slaty structure, and is not separable into laminae, like common talc. It approaches in character to steatite, and is used for similar purposes.

TALCA, a t. in Chili, in the province of Talca, of which it is the capital; pop. about 18,000. It is on the Maule river, about 45 m. n. of Chillan; contains a seminary for priests, and other educational institutions, and has a growing trade.

TALCOTT, ANDREW, b. Conn., about 1798; graduate of West Point, 1818. In 1819 he accompanied gen. Atkinson on an expedition to the upper Missouri and Yellowstone rivers to establish military posts; returned to the c. and in 1821-35 engaged in building defenses at Hampton Roads, fort Delaware, and other exposed situations. In 1832-36 he was engaged on the boundary line between Ohio and Michigan, and the improvements on the Hudson river; resigned 1836 and became division engineer on the Erie railroad. He has been on many important commissions for constructing dry-docks and defenses, and has been chief engineer of several railroads.

TALCOTT, JOHN, about 1625-88; b. England; brought to Massachusetts by his father who became one of the governor's "assistants." The son held the office of treas-

urer of the colony, and is best known as the leader of the expedition which saved Hadley from the attack of 700 Indians, and for his courage in other Indian warfare.

TALEGALLA, a genus of gallinaceous birds, of the family *megapodidae*, having a strong, thick, and very short bill, the upper mandible curved and pointed; the head and neck almost quite naked; the wings short and round; the tail rather long, rounded on the sides; the legs strong, feathered a little below the joint of the tibia and tarsus; the tarsi covered with scales in front; the toes long and strong; the claws large and sharp. The species are natives of Australia and New Guinea. The best known is the **BRUSH TURKEY** (*T. lathamii*) of Australia, also known as the **WATTLED TALEGALLA** and the **NEW HOLLAND VULTURE**, the latter name being given to it on account of its naked head and neck, covered in part with fleshy wattles. It is pretty common in New South Wales, inhabiting the most thickly wooded parts. It is a large bird, about the size of a turkey, with blackish-brown plumage. It is shy, and when pursued, endeavors to escape by running through the thickest brush, or by leaping to the lowest branches of a tree, from which it ascends higher and higher, branch by branch. It thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting under shelter of the branches of trees during the heat of the day, and although several of a flock are shot, the rest keep their place undisturbed. The talegalla is generally seen in small flocks, and they make their nests together, the males heaping up, by means of their feet, mounds of several cartloads of earth and decayed leaves, which are used from year to year, new materials being added every year. The eggs are hatched by the heat of the sun and of the fermenting mound, each egg being separately buried. The parent birds partially uncover them during the day. Nearly a bushel of eggs may sometimes be found in a single heap. The male bird pays great attention to the young after they are hatched, covering them up partially in the mound at night for warmth. The flesh of the talegalla is excellent, and the eggs are also very delicate and eagerly sought after. It is thought that this bird might easily be added to the list of our domestic poultry.

TALENT (Gr. *talanton*, from a root to balance or weigh), a word used by Homer to signify indifferently a balance, and a definite weight of some monetary currency. But the weight of money to which Homer applies the term talent was very different from that to which it was applied in later times. Tradition assigns to Pheidon, king of Argos, the introduction of the talent as a standard of money and weight. The exact identity of the Æginetan talent with that known as the Babylonian, and generally employed in the east, points to its true origin. It was in all probability introduced into Greece by the Phœnicians, who also introduced a smaller monetary measure and weight, which was by the Greeks known as the Euboic talent. The names Æginetan and Euboic indicate that the talents to which these epithets apply were first used in Ægina and Eubœa; and though, in the east, the larger talent was used for silver, and the smaller for gold, after their introduction into Greece all such distinctive application was soon done away with. The use of the Euboic talent was mostly confined to Athens, Chalcis, and the Chalcidian colonies; while the Æginetan prevailed over the rest of the Greek world. In the 6th c. B.C., Solon introduced at Athens a new talent, which, as the *Attic talent*, succeeded, partly through its superior purity, and partly on account of the greater commercial activity of Athens, in supplanting the other two standards. These several talents were similarly subdivided into 60 minæ, the mina into 100 drachmæ, and the drachma into 6 oboli; and their relative proportions are Æginetan talent: Euboic talent: Attic talent:: 30: 25: 18, both with respect to their values as weights, and as measures of monetary amount. The following are the values as compared with English standards:

	AS WEIGHT.		AS MONEY (SILVER).		
	lbs.	avoirdupois,	£	s.	d.
Æginetan talent	=	95.	=	406	5 0
Euboic "	=	79.16	=	338	10 10
Attic "	=	57.	=	243	15 0

But by the same decree of Solon, a new commercial talent, of increased weight, was introduced, but only as a weight for goods, not for money.

TALFOURD, Sir THOMAS NOON, D.C.L., 1795-1854; b. England; studied law; was a member of parliament from 1835-41, and 1847-49, when he received an appointment as judge of the court of common pleas. He advocated in parliament the rights of authors, and introduced in 1837 the copyright act, which with a few alterations was passed in 1842. He wrote the tragedy of *Ion* in 1835, which was performed with great success, and subsequently *The Athenian Captive* (1838); *Glencoe* (1840); and *The Castilian* (1854). He also published *Memoirs and Correspondence of Charles Lamb* (1837); *Final Memorials of Charles Lamb* (1848), and *Vacation Rambles* (1844).

TALIAFERRO, a co. in n.e. Georgia; drained by the Ogeechee and Little rivers; traversed by the Georgia railroad; about 200 sq.m.; pop. '80, 7,034—4,724 colored. The surface is irregular. The soil is fairly fertile. The principal productions are corn, cotton, and live stock. Co. seat, Crawfordsville.

TALIAFERRO, BENJAMIN, about 1751-1821; b. Va.; a member of Morgan's rifle corps; served at Saratoga, Moulmouth, and Savannah, greatly distinguishing himself for coolness and daring on the field. He was aid-de-camp to gen. Lincoln at Charleston in 1780, and was taken prisoner. In 1784 he removed to Georgia; delegate to the Georgia state constitutional convention, 1798; member of congress 1799-1802, and filled the office of judge of the superior court, state senator, and president of the state senate.

TALIESIN, a Welsh bard, said to be the son of Hweng, and supposed to have lived in the 6th century. He was called the "chief of the bards," and was, with the two Merlins, the most celebrated among the Christian bards. The *Archæology of Wales* contains some pieces said to be his.

TALIPAT PALM, or Great Fan Palm, *Corypha umbraculifera*, the noblest palm of the East Indies, a native of Ceylon, Malabar, etc. It grows to the height of 60, 70, or even 100 ft., and has a straight cylindrical trunk, crowned with a tuft of enormous palmate plaited leaves, which are divided near the outer margin into numerous segments, and are united to the trunk by spiny leaf-stalks. The leaves are usually about 18 ft. long, exclusive of the leaf-stalk, and 14 ft. broad; a single one being sufficient to protect 15 or 20 men from rain. At the age of 30 or 40 years the tree flowers, and, after ripening fruit, generally dies. It produces a long conical erect spadix, rising to the height of 30 ft. from the midst of its crown of leaves, and dividing into simple alternate branches, the lower of which sometimes extend laterally 20 ft., the whole covered with whitish flowers, and forming a very beautiful and magnificent object. The fruit is very abundant, globose, and about an inch and a half in diameter. The leaves are used for covering houses, for making tents, and for many other purposes. On occasions of ceremony every Singhalese noble is followed by an attendant, who carries above his head a richly ornamented talipat palm leaf, which is capable of being folded up like a fan, and is then not thicker than a man's arm, and wonderfully light. The leaves of this palm are used in Malabar for writing upon, characters being traced upon them with an iron style. They are prepared for this purpose by boiling, drying, damping, rubbing, and pressing. The soft central part of the stem, pounded and made into bread, has often been of great use in times of scarcity.

TALIPÉS, the scientific name for CLUB-FOOT (q.v.). It is derived from the Latin words *talus*, the heel, and *pes*, the foot.

TALISMAN (Arabie, but supposed to be derived from the Gr. *telesma*, in the sense of celebration of religious ceremonies), a species of charm, consisting of a figure engraved on metal or stone when two planets are in conjunction, or when a star is at its culminating point, and supposed to exert some protective influence over the wearer of it. The terms talisman and amulet (q.v.) are often considered nearly synonymous, but the proper distinctive peculiarity of the former is its astrological character. Talismanic virtues have often been attributed to a peculiarly marked or formed egg, and instances are recorded, by various authors, of eggs hatched with figures of comets or eclipses on them. A species of talisman, which has acquired considerable celebrity is the Abraxas stone (q.v.). A species of talisman at present in use in Asia, is a piece of paper on which the names of the seven sleepers and their dog are inscribed. Pasted on the walls of houses, it is believed to be a protection against ghosts and demons.

TALLADEGA, a co. in n.e. central Alabama; drained by the Coosa river and Choccolocco creek; traversed by the Selma, Rome and Dalton railroad; about 750 sq.m.; pop. '80, 23,360—12,504 colored. The surface is somewhat hilly, and much of it woodland. The soil is fertile. The principal productions are corn, cotton, wheat, and cattle. Co. seat, Talladega.

TALLADEGA, a city in n.e. Alabama, co. seat of Talladega co.; on the Selma, Rome and Dalton railroad; pop. '80, 1,232. It is built on the battle ground where gen. Jackson gained a victory over the Creek Indians in 1813, and is 85 m. n.e. of Montgomery and 110 m. from Selma. It is the seat of Talladega college, incorporated, 1869; supported by the American missionary society, for the education of white and colored of both sexes. The college has a preparatory, theological, and normal course, a primary, intermediate, and grammar department. In 1874-75 it had 13 instructors and 247 students. The city is also the seat of the state institution for deaf and blind, and of a Presbyterian female seminary. It contains 6 churches, supports 2 newspapers, has a court-house, a bank, and an important trade in cotton and wheat.

TALLAGE (said by lord Coke to be from Fr. *tailier*, to share or cut out a part), a name which has been sometimes applied generally to subsidies or taxes of every kind, but which, in its more proper and restricted sense, denotes those taxes to which, under the Anglo-Norman kings, the demesne lands of the crown and all royal towns were subject, which were far more rigorous and irregular than the taxes imposed on the gentry.

TALLAHASSEE, the capital of Florida, situated on a high plain, 180 m. e. of Pensacola, a well-planned, and so far well-built embryo city. It is celebrated for its salubrious, semi-tropical climate, and abundant springs of soft pure water. It is a station on the Jacksonville, Pensacola and Mobile railway, at the junction of a branch to St. Marks, 23 m. distant on the coast. Pop. '70, 2,023.

TALLAHASSEE (*ante*), a city, in n. Florida, incorporated, 1827; capital of the state, and co. seat of Leon co.; pop. '80, 2,494. It is 165 m. w. of Jacksonville, and 230 m. e. of Mobile. Its public buildings are beautifully shaded by oak and evergreen trees, and are built mostly of brick. It is the seat of the West Florida seminary, situated on a hill commanding a view of the city, a state institution for both sexes but with separate departments. The institution is supported by the proceeds of the sale of government lands, granted by congress to the state, and called the "seminary lands." There are public schools, 5 churches, 2 newspapers, and cotton factories.

TALLAHATCHIE, a co. in n.w. Mississippi, drained by the Tallahatchie river and several creeks; traversed by the Mississippi and Tennessee railroad; 750 sq.m.; pop. '80, 10,926—10,880 of American birth, 6,757 colored. The surface is level and in part swampy; cotton, corn, pork, and cattle are the staples. Co. seat, Charleston.

TALLAPOOSA, a co. in e. Alabama; drained by the Tallapoosa river and Sandy creek; traversed by the Savannah and Memphis railroad; 770 sq.m.; pop. '80, 23,400—23,376 of American birth, 7,295 colored. The surface is rough and heavily wooded: cotton, corn, cattle, wheat, and pork are staples. Co. seat, Dadeville.

TALLEYRAND-PERIGORD, CHARLES MAURICE DE, Prince of Benevento, the most subtle, shrewd, and unprincipled of all modern diplomatists, was b. at Paris, Feb. 13, 1754, of an ancient and distinguished family. His father, CHARLES DANIEL, COMTE DE TALLEYRAND-PERIGORD (b. 1734, d. 1788), was an officer in the French army, and fought all through the seven years' war. CHARLES MAURICE being the eldest son, would in all probability have been designed for a military career had not an accident which he met with when only a year old, rendered him lame for the rest of his life. He was, in consequence, trained for the church, and studied at St. Sulpice, the Sorbonne, and Rheims, but at no period did he betray the least inclination toward a Christian or even a moral life. At the age of 20 he came to Paris and rapidly acquired a reputation for licentiousness. This, however, did not prevent him from obtaining several ecclesiastical benefices, among others the abbacy of St. Denis, in the diocese of Rheims (1775). Appointed *agent général* for the clergy in 1780, a lucrative and important post, which brought him into close connection with the heads of the administrative in France, he now began a serious apprenticeship to public business, without, however, pausing in his career of gallantry. So notorious was his *infâme conduite* (as Mirabeau calls it), that for some years Louis XVI. shrank from conferring on him further ecclesiastical preferment, and it was only on account of his administrative abilities that in 1788 he obtained the bishopric of Autun. When the convocation of the *états-généraux* took place in the year following, he was elected by the clergy of his diocese to represent it, and pronounced in favor of an amalgamation with the *tiers état*, which on June 17 had constituted itself the *assemblée nationale*. His attitude and speeches recommended him to the notice of the popular party, and along with Mounier, Sieyès, and Lally-Tolendal, he was appointed to draw up a constitution for the nation. In this capacity he took an active part in framing the famous declaration of rights, and he was one of those selected (after the destruction of the Bastille) to investigate the causes and peculiar features of the revolutionary movement. It was Talleyrand who proposed (Oct. 10, 1789) the startling measure for the confiscation of church property, arguing that such property did not really belong to the church, but to the nation, and that if the rights of the existing clergy were secured, the nation or its representatives were at liberty to apply it to any purpose they saw fit. On Feb. 13, 1790, a decree for the suppression of religious orders was carried in spite of a vehement opposition, and three days after Talleyrand became president of the assembly. He was one of the first among his order to take the oath to obey the constitution (Dec. 28, 1790), and eagerly urged the clergy of his diocese to follow his example. About the same time he demitted his bishopric of Autun, yet in the following February we read of his consecrating two new bishops (those of Aisne and Finisterre), and although denounced in pontifical briefs as a schismatic, declaring his sincere attachment to the holy see!

Our space does not permit us to describe the important share that Talleyrand had in the financial deliberations of this first period of the revolution, but we must specially note the sagacity he displayed in pointing out the perils attending the issue of assignats, his skill in preparing the way for the adoption of the principle of uniformity in weights and measures, and of an arc of a meridian as the basis of the new metrical system; and, above all, the luminous intelligence shown in the report which he gave in to the assembly (Sept. 10 and 11, 1791) upon public instruction—a report conceived in the liberal and comprehensive spirit of the times, and which was undoubtedly the model followed in all the great changes that subsequently took place when France reorganized her educational system.

In 1792, when the old European despotisms were obviously preparing to coerce the young republic, Talleyrand was sent to London—but not in an official character—to negotiate with the English government. He did not make a favorable impression on George III. or on Pitt. Thrice in that year he essayed to procure a recognition of the republican government, but in vain. The "September massacres" (see SEPTEMBERISTS) made even the staunchest admirers of the revolution shudder. Nothing, therefore, could be done; and Talleyrand would doubtless have returned to France had not a letter of M. de Laporte, *intendant* of the civil list of Louis XVI., been discovered, in which Tal

leyrand was noted as a man "disposed to serve" the king. He was immediately placed on the list of *émigrés*, i.e., proscribed (Dec., 1792); and thus his connection with the revolution—fortunately, we believe, for his reputation—was suddenly brought to a close. His career as an exile was (as is generally the case) one of hardship and insignificance. He remained in England till forced to leave by the "alien bill," when he sailed for the United States (Feb., 1794), where he lived for more than a year. After the fall of the terrorists he procured the revocation of his banishment, and in March, 1796, re-entered Paris, having paved the way for a favorable reception by a series of the most adroit and judicious intrigues. We may first note, *en passant*, that in private life he continued to play the rôle of a gay Lothario.

Talleyrand attached himself to the *cercle constitutionnel* that gathered round Mme. de Staël, and so dexterously did he comport himself, that in 1797 he was named minister of foreign affairs in place of C. Delacroix. The rise of Bonaparte was a phenomenon which so penetrating a politician as Talleyrand could not overlook. He cultivated the friendship of the young gen. with a sagacious assiduity, keeping him constantly *au courant*, when away from Paris, of the situation of parties, and became his confidant in those designs, the execution of which resulted in the overthrow of the directory, Brumaire 18 (q.v.), 1799. After this *coup d'état* the subtle finesse of Talleyrand was constantly in requisition. He divined, with a sort of miraculous cleverness, the ideas of Bonaparte, and his whole policy was directed to consolidate the power and authority of his master. In all the diplomatic negotiations that followed the victories of France under the consulate he had the principal part; but Bonaparte thoroughly understood his man, and Talleyrand was quite conscious, as M. Thiers remarks, that he could never impose on his superior. It was he who proposed the kidnapping of the duke d'Enghien (q.v.); and it was by his instructions that the crime was consummated, in spite of the vehement opposition of Josephine, whose honest indignation led her to denounce him as a *maudit boiteux* (cursed cripple). Talleyrand took an active part in preparing the way for the establishment of the empire (1804); and when in the following year England, dreading a French invasion, formed a powerful European coalition against France, it was by the ingenuity of Talleyrand that it was partly broken up. To him, as much as to Napoleon, was owing the organization (1806) of the famous *confederation of the Rhine* (q.v.), which so effectually served the ambitious designs of the emperor. In conducting the negotiations that brought about this confederation he exhibited a truly Machiavelian art. Napoleon was not ungrateful. Talleyrand received the principality of Benevento, which he held as an imperial fief.

When the views of the emperor in regard to Spain became apparent, Talleyrand, who for more than a year had rather fallen into disfavor with Napoleon, came forward with a plan of his own, which, however, was not adopted; but his presence at the interview between Alexander and Napoleon at Erfurt (1808) proved that his influence was as yet undiminished. The ill success of the Spanish war (at first) induced Talleyrand to pronounce against it, and occasioned violent invectives on the side of his sovereign, to which the accomplished cynic (who retained to the last the manners of the old noblesse) only replied by the sarcasm: "*Quel dommage qu'un si grand homme soit si mal éduqué!*" (What a misfortune that so great a man should have been so badly educated!). Talleyrand declared in favor of the Austrian marriage; but already the *entente cordiale* between him and Napoleon was ruptured, and he began to look forward to a future in which his own schemes might be hostile to those of the emperor. In a word he was meditating treachery against the power by which he had risen. The victories of Wellington in Spain, and the reverses of Napoleon in Russia and Germany, widened the breach between them, and Talleyrand now only waited the decisive moment in which to ruin the cause of his master. He became the center of a group of Parisian malcontents, whose influence grew with the advance of the allied armies, and finally communications were opened up with the latter and with the Bourbons. It was Talleyrand who dictated to the senate the terms of the deposition of Napoleon; and on the restoration of the Bourbons he became minister of foreign affairs in the first government of Louis XVIII. He was also head of the French legation in the celebrated congress of Vienna; but after the battle of Waterloo a coldness sprung up between him and the Bourbons, and he was relieved of all his offices. Henceforth his career is uninteresting to the student of history. He caballed to regain power, but in vain; and during the reigns of Louis XVIII. and Charles X. he was merely a discontented senator, who never lost an opportunity of injuring the court and the government. After the July Revolution, Louis Philippe employed him as ambassador at the English court, where he contrived to bring about a friendly feeling between the new monarchy and the English government. During the brief remainder of his life nothing externally notable occurred. He died at Paris May 17, 1838. Talleyrand was neither a wise, nor a great, nor a good man; but he was infinitely cunning, dexterous, and supple. He had a larger share than most men of what Carlyle calls "vulpine understanding;" and if the world had had nothing but knaves and fools in it, the policy and principles of Talleyrand might have enjoyed a perpetual triumph; but there were forces in the world, both intellectual and moral, of which he took no account, but which took account of him, and, with all his amazing cleverness, dropped him into obscurity and disgrace. Talleyrand was an 18th c. skeptic, over whom the revolution had exercised little influ-

ence, while France, and indeed all Europe, had been roused into earnestness by the outburst; and when the ideas of political liberty began their swift, irresistible march, this *diable boiteux* inevitably lagged behind, and sunk out of sight. Talleyrand has left *Mémoires*, which are not to be published till 1890. For estimates of his character and policy, see the *Mémoires Politiques* of Lamartine; the *Histoire de Dix Ans* of Louis Blanc, where Talleyrand is rigorously criticised; the *Mémoires* of Guizot, where he is handled with equal severity and justice *Notices et Portraits*, by Mignet; and *Vie Religieuse et Politique de Talleyrand* (Par. 1838), by L. Bastide.

TALLICOO NAH OIL. See CARAPA.

TALLIEN, JEAN LAMBERT, a French revolutionist, was born at Paris in 1769, and first became notable in the beginning of 1792 as the editor of a Jacobin journal, called *L'Ami des Citoyens*, meant to be a friendly rival of Marat's *Ami du Peuple*. From this date his influence over the lower orders of the city steadily increased. He was conspicuous in the events of August 10, and in consequence received the appointment of secretary to the *Commune Insurrectionelle*. He promoted and afterward defended the massacres of September; and on account of his unscrupulous zeal, was elected to the convention by the department of Seine-et-Oise. There he became the apologist if not the advocate of Marat, denounced the minister Roland, urged with savage emphasis the condemnation of Louis XVI., and was rabidly eager for the ostracism and annihilation of the Girondists (q.v.). Toward the close of 1793 he was sent to Bordeaux, charged with the mission of destroying every trace of the party he hated. His career in the south-west was a mixture of reckless cruelty and shameful vice. To the odious tyrannies of a proconsul he added the luxurious profligacy of a satrap. Fortunately for his countrymen, a passion which he conceived for one of his victims, Madame de Fontenay (*née* Cabarrus), led him to pause in his bloody course. He was called to Paris to account for this singular change in his disposition, satisfied his associates (by paroxysms of patriotic vehemence) that it meant nothing particular, and on March 22, 1794, was chosen president of the convention. Robespierre, however, had found out the sort of man that Tallien was. He hated him for his insincerity and immorality, felt instinctively that he could not be trusted, denounced him severely in the convention, and on June 14 got his name erased from the list of members at the Jacobins. Tallien recognized his danger, and taking advantage of the reaction against the terrorists (though himself one of the basest of the set), already beginning to show itself in France, he dexterously rallied the Dantonists, Hebertists, and others against the rigorous government of Robespierre, St. Just, and Couthon, and brought about the events of the 9th Thermidor (July 27, 1794), which caused the fall of the triumvirate. Tallien now became for a short time one of the most notable and influential men in France; lent his aid to suppress the revolutionary tribunal and the Jacobin club, and drew up the accusations against Carrier, Le Bon, and others of the terrorists! But France could not long tolerate this affectation of virtue on the part of one so infamous: his past life was perpetually held up to scorn and reproach; and finally, on May 20, 1798, he was forced to leave the council of five hundred. Henceforth his career is pitifully insignificant. He accompanied Bonaparte to Egypt as *savant* (!), quarreled with gen. Menou, and on his return to France, was captured by an English cruiser, and brought to England, where the whig opposition was stupid enough to make a hero of him (1801). Soon after he returned to France, and was contemptuously dismissed as consul to Alicante by Talleyrand, outlived (in utter obscurity) the empire of Napoleon, and died at Paris, Nov. 16, 1820, supported in his last days by the heirs of the monarch for whose death he had inhumanly clamored.

TALLIS, THOMAS, 1529-85, b. England; was organist to queen Elizabeth. He has been called the father of "English cathedral music." He published with William Byrd, *Discursus Cautiones Sacre*, for which he was granted a patent for 21 years from the queen; *Order of Daily Service*; *Full Cathedral Service*; *Order for Morning Prayer with the Litany* Noted.

TALLMADGE, BENJAMIN, 1754-1835; b. N. Y.; graduated Yale college, 1773; principal of a high school at Wethersfield, Conn.; entered the continental army; became lieutenant, adjt., and col. of a Connecticut regiment, 1776; surprised and captured 500 tory marauders at Lloyds' Neck, L. I., Sept. 5, 1779, without losing one of his men; planned and led the expedition which took fort George, Oyster bay, and destroyed the British stores on Long Island, 1780; was in some of the principal battles of the war, had charge of maj. André until the execution of his sentence; was one of Washington's military family, and conducted his secret correspondence; was a successful merchant after the war, and a member of congress, 1801-17. His *Memoirs* were published by his son.

TALLMADGE, FREDERICK AUGUSTUS, 1792-1869; b. Conn.; graduated at Yale college, 1811; studied law at Litchfield, and was there admitted to the bar. He practiced with great success in New York, where he held the offices of recorder, superintendent of police, and clerk of the court of appeals. He was a state senator in 1836, and about the same time a judge of the supreme court of errors. At the "Astor place riot" of 1849 he showed great firmness in restoring order.

TALLMADGE, JAMES, LL.D., 1778-1853; b. N. Y.; graduated at Brown university, 1798; practiced law, but gave his attention chiefly to agriculture; was for some time private secretary of governor George Clinton, and in the war of 1812 commanded the troops that defended New York; was a member of congress, 1817-19, and to a bill for the organization of Missouri into a state, he offered an amendment restricting slavery to the region w. of the Mississippi; was a member of legislature, 1824; lieutenant governor, 1826-27. In 1835 he visited Europe, and introduced American machinery into Russia.

TALLOW. See OILS AND FATS.

TALLOW, MINERAL. See MINERAL TALLOW.

TALLOW TREE, the name given in different parts of the world to trees of different kinds which produce a thick oil or vegetable tallow, or a somewhat resinous substance, which, like tallow, is capable of being used for making candles. Tallow tree of Malabar (*raterie indicu*) is a very large tree of the natural order *dipterocarpaceæ*. It has leathery leaves of 4 to 10 ft. long, and panicles of white, fragrant flowers, with five petals. The stem is often 16 ft. in circumference. By incisions in the stem, east Indian copal is got; and by boiling its seeds, there is obtained a firm, white, vegetable tallow, which, as it has no unpleasant smell, is particularly suitable for making both candles and soap.—The tallow tree of China (*stillingia sebifera*) belongs to the natural order *euphorbiaceæ*. The capsules are internally divided into three cells, each containing a nearly hemispherical seed, which is covered with a beautifully white vegetable tallow. This the Chinese collect for the manufacture of candles, in order to which, the capsules and seeds are crushed and boiled, and the fat skimmed off while in a melted state. To give it a firmer consistency, wax is added to it, in the proportion of three parts to ten of the vegetable tallow. Linseed oil is also added. The candles made of it are beautifully white. This tree has been introduced into North America, is cultivated about Charlestown and Savannah, and is almost naturalized in the maritime parts of Carolina. It presents a very beautiful and remarkable appearance at the approach of winter, when the leaves become bright red, and the pericarps falling off, leave the white seeds suspended by threads.—The name tallow tree is sometimes given in North America to a species of *Candleberry* (q.v.).—The tallow tree, or **BUTTER AND TALLOW TREE** of Sierra Leone, is *pentadesma butyracea*, of the natural order *guttifere*, the fruit of which furnishes a solid oil.

TALLY (Fr. *tallier*, to cut), the name given to the notched sticks which, till a recent period, were used in England for keeping accounts in exchequer, answering the double purpose of receipts and public records. They were well seasoned rods of hazel or willow, inscribed on one side with notches indicating the sum for which the tally was an acknowledgment, and on two opposite sides with the same sum in Roman characters, along with the name of the payer and the date of the transaction. Different kinds of notches, differing in breadth, stood for a penny, a shilling, a pound, £20, £100, and £1000. The tally was cleft through the middle by the deputy-chamberlain with knife and mallet, so that each piece contained one of the written sides, and a half of every notch; and the one-half was retained by the payer as his receipt, while the other was preserved in exchequer. At the union of England and Scotland, a store of hazel rods for tallies was sent to Edinburgh, but never made use of. Act. 23, Geo. III. c. 82 abolished the use of tallies in exchequer, and the old tallies were ordered to be destroyed by 4 and 5 Will. IV. c. 15. The destruction of the houses Parliament by fire in 1834 is supposed to have arisen from the over heating of the flues in which the discarded tallies were being burned.

TALLY SYSTEM is the name given to a mode of buying goods much in vogue among the wives of poor men, whereby they get goods, chiefly articles of dress and cheap finery, on credit, or on terms of payment by small weekly sums till the debt is paid. It, in point of law, gives rise to the following hardships and disadvantages whenever, as is usually the case, the wife, in the absence of, and without the knowledge of, the husband, enters into the contract, and purchases goods which are beyond her station. The husband, when sued in such a case on the contract, can set up a good defense. If he had given his wife sufficient clothes, either in specie or the means of buying them, he is not liable to pay any tradesman who, without his sanction, supplies the wife with more, especially if these are articles of finery. It is only in the case of the articles being strictly called necessities, that he will be bound at all; and as regards women of the lower classes, a court or jury would construe the word "necessaries" very strictly in favor of the husband. If the articles are extravagant, and beyond the station of the wife, the husband is then not liable to pay for the price, and no court will compel him to do so. The only ground on which he can be made liable will be, that the husband knew of the purchase, and directly or indirectly sanctioned it; as, for example, by seeing her wear the clothes, and not returning them, or giving immediate notice to the tallyman that he objected to the purchase. Nevertheless, it must be confessed that judges are not uniform in their decisions, and some too easily give effect to the contract, for want of strong evidence on the part of the husband of the earliest disavowal of it he could make. The tallyman generally makes it a stipulation that the bargain shall be kept secret for a certain length

of time. Nevertheless, if, when it is discovered, the husband at once repudiates and returns the articles, it is the tallyman's own fault if he is then obliged to take them back after they have been partly used, and he cannot fix the husband with liability.

TALMA, FRANÇOIS JOSEPH, an eminent French tragedian, was the son of a dentist, and was b. at Paris, Jan. 15, 1763. He made his *début* as an actor in 1787 at the Comédie Française, where he played the part of Séide in *Mahomet*. He achieved considerable success, but apparently not enough to excite any very high anticipations of his future career, and for upward of a year he figured only in secondary characters. The first thing that induced the public to notice him attentively was an innovation in the matter of costume when playing the part of Proculus in the tragedy of *Brutus*. Previously, actors had worn the garb of their own country, and even their own time; and Roman senators stalked about the stage dressed as Parisian "swells" of the 18th century. The absurdity of this fashion forcibly struck Talma, who set himself to amend it, and in the part referred to appeared in the green-room clothed in a Roman toga, greatly to the astonishment of the company, one of whom (Louise Contat) exclaimed: "Good God! look at Talma; how ridiculous he is! *Why, he has quite the air of an ancient statue!*" The compliment was as exquisite and as just as it was unintentional. Henceforth, a rigorous accuracy in costume became a point with Talma; but his first grand triumph in acting was won, Nov. 4, 1789, when he played Charles IX. in Chénier's piece of that name. During the revolution he was in the zenith of his popularity, and made peculiarly his own such characters as Abdélazis, in *Abdélazis et Zuléma*; Othello; Néron, in *Epicharis et Néron*; Pharan, in *Abufar*; and Egisthe, in *Agamemnon*. Exceedingly arrogant and choleric, he was often at strife, either with the public or with some of his fellow-actors. Talma was a favorite with Napoleon and Louis XVIII. Some of his later characters were among his best, as Marigny, in *Les Templiers*; Leicester, in *Mercé Stuart*; Sylla; Oreste in the *Clytemnestre* of Soumet; Leonidas; and Charles VI. He died Oct. 19, 1826.

TALMAGE, THOMAS DE WITT, D.D., b. N. J., 1832; graduated at New York university, 1853; studied theology at New Brunswick, and in 1856 became pastor of the Reformed church in Belleville, N. J.; in 1859 received a call to the Reformed church in Syracuse, N. Y.; and from 1862 to 1869 was settled in Philadelphia. In the latter year began his connection with the Brooklyn Central Presbyterian church, over which he is still pastor. The original "Tabernacle" was erected in 1870, and destroyed by fire in 1872. In 1874 a new building of brick and stone and of Gothic style, with a seating capacity of 4,600, was dedicated. This is the largest Protestant church in this country. Mr. Talmage has published *The Almond Tree*; *Crumbs Scent Up*; *Abominations of Modern Society*; *Sports that Kill*; *Every-day Religion*; and other writings. He was for several years editor of *The Christian at Work*. In 1879 charges of falsehood and dishonorable business conduct were brought against Dr. Talmage before the Brooklyn presbytery. He was acquitted, and the decision was sustained by the synod and (May, 1881) by the assembly.

TALMUD (from Heb. *lamad*, to learn)—i.e., study, by way of eminence—is the name of the fundamental code of the Jewish civil and canonical law, comprising the Mishna (q.v.) and the Gemara (q.v.), the former as the text, the latter as the commentary and complement. We have spoken under HALACHA and HAGGADA of the gradual development of this "oral," or, chronologically speaking, post-Mosaic code. We have also there mentioned the older collections upon which the Mishna was framed, and finally redacted in the form in which we now possess it. The oldest codification of Halachoth, or single ordinances, is due to the school of Hillel (q.v.), Simon ben Gamaliel the patriarch (166 A.D.) and his school carefully sifted the material thus brought together; and in the following generation, through Jehudah Hanassi (219 A.D.) and his disciples, the work was brought to its close in six portions (Sedarim), 63 treatises (Mesichoth), and 524 chapters (Perakim), which contain the single Mishnas. A summary of its contents is given under MISHNA. But besides this authoritatively compiled code, there were a number of other law collections, partly anterior to it, and not fully embodied in it, partly arising out of it—as supplements, complements, by-laws, and the like—partly portions of the ancient Midrash (q.v.); partly either private text-books composed by the masters of the academies for their lectures or enlargements of the existing Mishna. All this additional legal material was collected, not rarely together with the dissensions which begot it, under the name of *Boraitoth*, by Chija and his school, in the succeeding generation. Not to be confounded with them, however, are the collections of *Toseftas* or *Great Mishnas*, which, commenced at the time of Jehudah Hanassi himself, and continued after his death by Chija and Hoshaja, embody much of what has been purposely left out in the concise Mishna; that only embraced the final dicta and decisions. Such "additions" we possess now to 52 treatises, forming together 383 perakim, or chapters. All these different sources of the "oral law"—finally redacted before the end of the 3d c., though probably not committed to writing until 550 A.D.—belong to the period of from about 30 B.C. to about 250 A.D. This great mass of legal matter, although apparently calculated to provide for every case, if not for all times, was yet found insufficient. The dicta of later masters, the decisions of the courts, the discussions on the meaning and purport of special traditions, the attempts at reconciling apparent contradictions in the

received material, the amplifications or modifications of certain injunctions rendered necessary by the shifting wants and conditions of the commonwealth—all these and a number of other circumstances made a further codification peremptory.

We must not omit to state here, that this Mishna (Mathnisin), although it contained nothing but what were indigenous laws and institutions, was yet not a little influenced—if the very fact of its redaction was not indeed caused—by the spirit of the times. At Berytus, at Alexandria, at Rome, the legal schools were then in their most vigorous stage of development, and everywhere system and method were being introduced into what till then had been a vast complex of traditional and popular institutions, decrees, and decisions. The Mishna, in all respects, fulfilled the conditions reasonably to be demanded from such a text-book as it was intended to form; it was clear, concise, complete, and systematic, and moreover, composed in as classical a Hebrew as still could be written in those days of decadence of the “sacred language.”

The further development of this supplementary, oral, or second law, in fact, rather an exegesis thereof, together with the discussions raised by apparent contradictions found in the individual enactments of the Mishnic doctors, is called *Gemara* Discussion, Complement, or, according to another explanation, Doctrine. Whatever the original meaning of the root (*gamar*), it certainly allows of all the significations. This *Gemara* contains, apart from the Halacha (q.v.), which is generally written in Aramaic, also a vast number of non-legal, chiefly Hebrew, fragments—homiletic matter, tales, gnomes, legends, and the like—called *Haggada* (q.v.).

There are two Talmuds, the one called the Talmud of the Occidentals, or the “Jerusalem” (Palestine) Talmud, which was closed at Tiberias, and the other, the “Babylonian” Talmud. The first of these now extends over 39 treatises of the Mishna only, although it once existed to the whole of the first five *Sedarim* or portions. Its final redaction—falsely attributed to R. Jahanan (died 279)—probably belongs to the end of the 4th c. A.D.; but the individual academics and masters through whom it received its completion cannot now be fixed with any degree of certainty. There is less discussion and more precision of expression in this than in the second or Babylonian Talmud, emphatically styled “our Talmud,” which was not completed until the end of the 5th c., and which makes use of the former. As the real editor of the Babylonian Talmud, is to be considered Rabbi Ashe, president of the academy of Syra in Babylon (365–427 A.D.). Both the Mishna and the Palestine *Gemara* had, notwithstanding the brief period that had elapsed since their redaction, suffered greatly, partly by corruptions that had crept into their (unwritten) text through faulty traditions, partly through the new decisions arrived at independently in the different younger schools—of which there flourished many in different parts of the Dispersion—and which were at times contradictory to those arrived at under different circumstances in former academics. To put an end to these disputes, and the general confusion arising out of them, which threatened to end in sheer chaos, R. Ashe, aided by his disciple and friend Abina, or Rabina (abbr. from Rab Abina), commenced the cyclopean task of collecting anew the enormous mass of Halachistic material which by that time had grown up. The method he pursued was simple enough. His disciples met twice a year at Syra, in spring and in autumn. At the spring gathering, he gave out all the paragraphs of one treatise; and the disciples had the task to find out until the autumn meeting what opinions the different schools had pronounced on the special points thereof. He then investigated the whole critically, and put it into shape according to a certain order. This process took him, with the assistance of ten secretaries, no less than thirty years; and another thirty years were spent by him in the revision of the work, with which he proceeded in the same manner as he had done with the compilation itself. The final close of the work, however, is not due, as generally stated, to R. Jose, his successor at the academy (died 475), but to the school of the Saburaim at the end of the 5th century.

The Babylonian Talmud, as now extant, comprises the *Gemara* to almost the whole of the 2d, 3d, and 4th *Sedarim* (portions), further to the first treatise of the first, and to the first of the last order. The rest, if it ever existed, seems now lost. The whole work is about four times as large as the Jerusalem one, and is 36 treatises, with the commentaries generally added to them in our editions (Rashi and Tosafoth), fill 2,947 folio leaves. The language of the Talmud is, as we said, Aramaic (western and eastern), or “Chaldee,” closely approaching to Syriac. The minor idiomatic differences between the two are easily accounted for by the different time and place; but the additional matter—quotations and fragments from older Midrash and *Gemara* collections, *Haggada*, etc.—is, as before stated, principally written in Hebrew.

The masters of the Mishna (Tannaim) and of the *Gemara* (Amoraim) were followed by the Saburaim (see above). The code of the oral law had come to a close with the second named; and not its development, but rather its proper study, elucidation, and carrying into practice, was the task of the generations of the learned that followed. Apart from this, the Aramaic language itself began to die out as the popular language, and required a further study. The Saburaim no longer dared to contradict, but only opined on the meaning and practicability of certain enactments, and undertook the task of inculcating and popularizing the teachings laid down by their sires: apart from bestowing proper care upon the purity of the text itself, and adding some indispensable glosses. Their activity was at its height in the 8th c., when Karaites (see JEWISH SECTS), which utterly

denied the authority of the Talmud, sprang into existence. Respecting, however, this authority of the Talmud itself, there has never been anything approaching to a canonicity of the code, or of a reception of it as a binding law-book by the whole nation. The great consideration in which it was always held is owing partly to its intrinsic value, and to the fact of its becoming the basis of all further development of Jewish literature (it being undeniably the most trustworthy receptacle of the traditional Jewish law), and partly to a prosecution against the Jews in the Persian empire at the time of Jesdegerd II., Firuz, and Kobad, who closed the schools and academies for a space of nearly 80 years, during which this book was the sole authoritative guide of public conscience, and remained endowed with its importance ever when the schools were restored. The best commentaries of the Mishna are by Maimonides and Bartenora; of the Babylonian Talmud by Rashi (q.v.) and the *Tosafists* of France and Germany. An abstract of the Talmud for practical (legal) purposes by Maimonides (q.v.) is called *Mishne Thorah*. The Mishna was first printed at Naples, 1492; the Talmud of Jerusalem at Venice about 1523. The Babylonian Talmud was first published at Venice in 1520. It is generally printed in twelve folios, the text on the single pages being kept uniform with the previous editions, to facilitate the references. No translation of the Gemara has ever been carried further than a few single treatises. The complete Mishna, on the other hand, has been translated repeatedly into Latin, German, Spanish, etc., by Surenhus, Rabe, Jost, and others. We must refrain, in this place, from attempting a general characterization of the Talmud, a work completely *sui generis*. It will assuredly some day, when properly investigated, prove one of the most important records of humanity. Nothing can give even an approximate idea of the immensity of material, historical, geographical, philological, poetical, that lies hidden in its mounds. A contribution to the records of fanaticism may also be found in the "exoteric" history of the Talmud, which was, albeit utterly unknown save by a few garbled extracts, prohibited, confiscated, burned, and generally prosecuted and inveighed against by emperors, popes, theologians, and fanatics generally, from Justinian down almost to our own day, as perhaps no other book has ever been. In our own times, however, its value begins to be recognized by great scholars, not merely as the only source of the knowledge of Judaism, but as the chief source—next to the gospels—even for the history of the origin and early days of Christianity; a notion long ago hinted at by eminent divines like Lightfoot and others. See also JEWS, MIDRASH, MISHNA; HALACHA, HAGGADA; and an important essay in the *Literary Remains* of Em. Deutsch, author of the above article.

TALPIDÆ. See MOLE.

TALUS, a term employed in geology, to designate the sloping heap which accumulates at the base of a rock or precipice, from fragments broken off by the weather, or materials in any way carried over it. The term is also applied to the slope of a wall which diminishes in thickness as it rises.

TAMA, a co. in e. central Iowa; drained by Iowa river and Wolf creek; crossed by the Burlington, Cedar Rapids and Northern, and the Iowa division of the Chicago and Northwestern railroads; 720 sq.m.; pop. '80, 21,585—17,561 of American birth; 413 colored. The surface is in great part prairie; oats, wheat, hay, corn, and pork, are the staples. Co. seat, Toledo.

TAMANDUA, a species of the genus *myrmecophaga* or ant-eater (q.v.). The great ant-eater or *M. jubata* of Linneus, is called tamandua by the Portuguese, but ant-bear by the English and Spaniards. The proper tamandua, so called by the Portuguese of Brazil, is the *M. tamandua* of Cuvier, and is much smaller than the great ant eater, being about the size of a large common cat, and its head is not so disproportionately long, although it has much resemblance, and the same kind of snout and nostrils. Its length, from the root of the ear to the muzzle, is 5 inches. The greatest circumference of the head, just in front of the ears, is a little over 8 inches. The conformation of the extremities, the number of toes, before and behind, are in all respects the same as the great ant-eater, but it differs in having a prehensile tail, which is covered with short hair, as is also the body, while the great ant-eater has long, shaggy hair, and a bushy tail. The eyes of the tamandua are very small, as are also the round ears. The legs are short and robust. There are several varieties, chiefly distinguished by differences of color. It is a native of the thick forests of tropical America, and is said never to be found on the ground, but exclusively in trees, where it lives upon ants, honey, and it is said, even bees. When going to sleep it hides its muzzle in the fur of its breast, places its belly on a limb, and wraps the whole around with its tail. The female, as is the case with the great ant-eater, has two pectoral mammae and bears but a single cub at a birth, which she carries about on her shoulders for the first three or four months. It has a strong, disagreeable odor, which is perceptible at a great distance, especially if the animal is irritated. It is called *fourmillier* by the French, and little ant-bear by the English.

TAMAQUA, a borough in Schuylkill co., Pennsylvania, on the Little Schuylkill river, and on branches of the Philadelphia and Reading, and the Central railroad of New Jersey; pop. '70, 5,960. It has churches, schools, banks, and newspapers. It is the center of a district abounding in coal and iron. The shops of the Philadelphia and Reading railroad are here. Among its manufacturing establishments are breweries, foundries, rolling mills, machine shops, and saddle and harness factories.

TAMARACK. See LARCH.

TAMARA SPICE, a favorite mixture of condiments used by the Italians. It consists of powdered cinnamon, cloves, and coriander seeds in equal parts, and half the same quantity of aniseed and fennel-seed powdered.

TAMARIN, *Midas*, a genus of South American monkeys, small and beautiful, with short muzzle, prominent forehead, long nails, which, except on the hinder thumbs, are formed like claws, the tail longer than the body, not prehensile, and covered with hair so as to resemble the tail of a squirrel. The SILKY TAMARIN or MARAKINA (*M. rosalia*), is the best known of the genus. It is of a golden yellow color, with fine silky hair, of which it is exceedingly careful, to keep it free from stain. It is often brought to Europe, but is very tender, and seldom lives long. It is a very gentle and playful creature. The hair of the head and neck is elongated, so as to form a wig or mane; but this character appears far more strongly in the LITTLE LION MONKEY (*M. leonina*), which inhabits the eastern slope of the Cordilleras, and of which, although it is a very small animal, not many inches long, the appearance is an amusing caricature of that of the lion.

TAMARIND, *Tamarindus Indica*, a beautiful tree, of the natural order *leguminosæ*, suborder *Cusaltpineæ*, a native of the East Indies, but now very generally cultivated in warm climates. Only one species is known (*T. Indica*), a spreading tree, 30 or 40 ft. high, with alternate pinnate leaves, which have from 12 to 15 pair of small leaflets, and fragrant flowers, with three petals, the pods brown and many-seeded, as thick as a man's finger, and about six in. long. The pods are filled with a pleasant, acidulous, sweet, reddish-black pulp. It is brought to Europe, mixed with seeds and fibers, in the form of a mass resembling jam, from the East and West Indies, and the Levant. Tamarinds are generally preserved by throwing hot syrup on the ripe pulp; but a better method is to put alternate layers of tamarinds and sugar in a stone jar, the color and taste being thus more like those of the fresh pulp. The wood of the tamarind tree, and especially of its roots, is a cabinet wood of much beauty, but of extreme hardness, so that it is wrought with difficulty.—The pods of some other trees of genera allied to *Tamarindus* are filled with a similar pulp, which is used in the same way, as the tamarind plum of India (*dialium Indicum*), and the brown and velvet tamarinds of Sierra Leone, species of *codarium*.

On chemical analysis, tamarind pulp is found to contain citric, tartaric, and malic acids; potash, sugar, vegetable jelly, etc. As a salt of copper is a common adulteration, a piece of polished iron (a knife, for example) should be plunged into the pulp, and left in it for an hour, when, if copper be present, it will be deposited on the iron. Tamarind pulp is refrigerant and gently laxative; and in combination with more active remedies, is often employed in the diseases of children. It is used in India as a cooling article of food, and a kind of sherbet is also formed from it; it is also an excellent addition to curries. Tamarind tea is made by infusing tamarinds in boiling water; when cold, it forms an agreeable and cooling drink in inflammatory or febrile disorders. Tamarind whey is prepared by boiling one ounce of tamarinds with a pint of new milk, and straining: this also is an excellent cooling drink in similar cases.

TAMARISK, *Tamarix*, a genus of plants of the natural order *tamaricacæ*. This order contains rather more than forty known species, all natives of the warmer parts of Europe and Asia, and of Africa, generally growing in arid situations. Some of them are herbaceous, others are shrubs or small trees, with rod-like branches, scale-like leaves, and small flowers in close spikes or racemes. The calyx has four or five segments; the corolla four or five petals; the stamens are hypogynous, equal in number to the petals, or twice as many; the pistil has three styles; the fruit is a one-celled capsule, with numerous hairy seeds. The COMMON TAMARISK (*T. Gallica*) grows in sandy places in the countries near the Mediterranean, and has been naturalized in some places on the southern coast of England. It sometimes attains a height of 30 feet. The twigs seem to possess tonic properties, and their medicinal virtues were once in high repute. The ashes of this and some other species of the genus contain much sulphate of soda.—The ORIENTAL TAMARISK (*T. orientalis*) is one of the few trees to be seen in the Arabian and African deserts, with the sands of which it seems to struggle more than any other tree or shrub. Its leafless appearance accords with the surrounding desolation. It is called *allé* or *ethel*, and its wood is used both for fuel and for many economical purposes.—Galls are found on some species in India, and are valued both for medicinal use and for dyeing. *T. mannifera*, perhaps a variety of *T. Gallica*, yields the kind of manna (q.v.) known as Mt. Sinai manna.—The GERMAN TAMARISK (*myricaria Germanica*) belongs to another genus of this order. It is a smaller shrub than the common tamarisk, and abounds in many parts of Europe and Asia, although not found in Britain. It was formerly supposed to possess valuable medicinal properties, but is now little regarded.

TAMATAVE, a t. on the e. coast of Madagascar, in lat. 18° 10's.; long. 49° 25' 30"e.; pop. '70, 7,500. The town is approached through narrow channels formed by coral reefs; is surrounded by palisades, and is the principal port on the island. The dwellings of the natives are of simple construction, with thatched roofs. The principal trade is

from the interior; its exports are india rubber, and hides; its imports are rum, brandy, shoes, sheetings, and salt.

TAMAULIPAS, a state in e. Mexico, bounded on the n. by Texas, on the e. by the gulf of Mexico, on the s. by Vera Cruz, and on the w. by Nuevo Leon and San Luis Potosí, drained by the Rio Grande del Norte, the Santander, the Tampico, the Fernando, and other streams; about 29,500 sq.m.; pop. '71, 108,778. The surface is uneven, and well wooded. Gold and silver are found. The soil is mostly fertile. The principal crops and fruits of both the temperate and torrid zones grow easily. Cattle, are the chief staple. Capital, Nuevo Santander.

TAMBOUR (Fr. *tambour*, drum), a frame upon which muslin or other material is stretched for embroidering. The tambour frame originally was made round. Tambour-work was extensively employed, for the decoration of large surfaces of muslin, etc., for curtains and similar purposes; but pattern-weaving has been brought to resemble it so closely, that it is being rapidly superseded.

TAMBOUR, in fortification, is a small work, usually a timber stockade, about 6 ft. high, and loopholed. Its object is to defend a gateway, the road into a village, or to afford flanking fire on a bridge, etc. The tambour on the covered-way is the traverse which closes an entrance from the glacis.

TAMBOURINE, a very ancient musical instrument of the drum species, much used by the Biscayan and Italian peasants at their festivities, and sometimes introduced into orchestral music where the subject of the piece is connected with a people who use it, as the Basques, gipsies, or peasants of the Abruzzi. It is composed of a piece of parchment, stretched on the top of a hoop furnished with little bells, and is sounded by the hands, fingers, or elbow. When sharply struck by the hand, the tambourine has not much effect, unless used in numbers. When sounded by gliding the fingers along the parchment, a roll results, in which the bells are chiefly heard; and by rubbing the parchment, without quitting it, with the whole weight of the thumb, the instrument gives out a wild, grotesque sound, which is sometimes of service in masquerade scenes.

TAMBOV, a government in the s.e. of Great Russia, bounded on the e. by the governments of Penza and Saratov. Area, 25,542 sq.m.; pop. '70, 2,150,971. The southern districts are hilly; the interior is a somewhat elevated plateau, with a gradual slope toward the north. Several lakes are found in the n. of the government, and the principal streams are the Tsna, an affluent of the Moksha, and the Moksha, which is itself an affluent of the Oka. The climate of Tambov, owing to its exposure to the biting n. winds, against which there is no protection, is more severe than in neighboring governments. The soil in the central and southern districts is a rich vegetable mold, and is very productive. In the n., clay predominates, and requires much manure. The chief agricultural products are rye, wheat, buckwheat, oats, hemp, and flax. The larger forests are found in the n., and pasture lands extend for the most part along the banks of the rivers. Agriculture and cattle-breeding are the principal employments; and some of the breeds of oxen, sheep, and horses, are excellent. Cloth, distilled liquors, tallow, and iron, are the chief manufactures. The products of the government are exported largely by the Tsna and the Moksha to the Oka and Volga.

TAMBOV, capital of the government of the same name, on the Tsna, 750 m. s.e. of St. Petersburg. It was founded in 1636 under the czar Michael Theodorovitch, and served as a fortress against Tartar invasion. It is regularly built, and, though the houses are mostly of wood, there are several important institutions, as the college, the military hospital, etc. Tambov is the seat of considerable manufacturing trade, there being in all 28 factories, in which cloth and sailcloth are extensively made. The chief articles of trade are leather, wool, tallow, and salt beef. Pop. '67, 28,617.

TAMBURINI, ANTONIO, b. Italy, 1800; made his début as a singer at Bologna in 1818. He soon gained a high reputation in Italy, and increased it in London and Paris, where he appeared in 1832. He had a powerful baritone voice, and was a good actor. He sang for several seasons in Bellini's *Puritani*, with Grisi, Lablache, and Rubini. His best part was "Don Giovanni." He retired from the stage in 1854, and took up his residence in France.

TAME ANIMALS, in point of law, render their owners subject to certain liabilities. There is no restriction as to what wild animals may be tamed; and the person who tames one, and retains possession, becomes the owner of it. There is, however, in all such cases an obligation on the owner to keep the animal with due care; and if it tends to be a nuisance to a neighborhood, he would, in extreme cases, be liable to an indictment, or in most cases, to an action of damages. If the animal tamed is naturally ferocious, then it is incumbent on the owner to keep it secure, so as not to allow it an opportunity of doing mischief; and in case of accidental escape, it is seldom that a jury will be persuaded that the owner is not guilty of negligence, and liable for the damage done. There is a certain class of animals which may exist in a wild state, yet by long use, or a second nature, have become domesticated, such as dogs and cats, and are called *mansuetæ naturæ*, in contradistinction to ferocious animals, such as lions. With regard to animals *mansuetæ naturæ*, the rule is, that the owner is only liable for mischief done by such animals when he has been guilty of some negligence in keeping such animals; and

in practice this amounted to saying that, if the owner was ignorant that the animal had once before done similar mischief, he would not be liable, unless he had omitted to take care to restrain that evil propensity. Thus, if a dog or cat, from some sudden whim, chose to attack some person, or other animal, not being incited to it by the owner, such owner is not at common law liable for the first offense; but in case of a second offense, he was generally held liable, at least whenever there was evidence of slight negligence superadded. Hence, if a dog worried sheep casually, the owner was held to be not liable, if it was the first offense. This state of the law was, however, found to work harshly, and a statute passed first for Ireland, then for Scotland, and lastly for England, the effect of which is to make the owner of a dog liable for damages caused by its worrying sheep, even though it is the first offense, and though the owner was not guilty of any negligence. These statutes passed in 1862, 1863, and 1865 respectively, and they establish an exception to the general rule, which still is in force, as to mischief done by dogs, other than worrying sheep—namely, that before the owner can be made liable, it must be proved that he knew of the dog or cat's mischievous propensity to do the act in question, and did not use due care in restraining it. This is the rule where, for example, a dog bites a person, or a bull gores a passenger. In short, negligence is the gist of the action, and more than mere ownership must be proved against the owner. Sometimes owners of lands plant spring-guns, traps, and similar implements, with a view to kill dogs, cats, and other vermin straying in such fields. The practice of placing spring-guns and man-traps, with a view to kill poachers, was found once to prevail, and created a great outcry about fifty years ago; and the legality of the practice was questioned, but the judges in England held, that if the man injured was a trespasser, the owner of the land was not liable; consequently, a statute was passed to make it illegal in future to place such engines, except in, and close to, dwelling-houses. In Scotland the judges held that the practice was illegal at common law, and no statute was necessary. But though man-traps put in fields are now illegal, traps which destroy dogs or cats are not so, with this qualification, however, that the traps must not be put near a highway, where the dog or cat might be lured aside when lawfully passing, as this would be taking too great an advantage of the instincts of the animal. As regards the stealing of tame animals, it was a technical defect in the common law of England that the offense of larceny could not be committed upon them; but by statutes it is provided that in most cases the offense of stealing or destroying tame animals is punishable either by fine or by imprisonment, in much the same way as larceny is punishable.

TAMERLANE. See TIMŪR

TAMIL' (more properly spelled *Tamir'*, but erroneously written *Tamul*, and erroneously termed by the earlier Europeans "the Malabar") is the name of the language earliest cultivated of all the idioms which the rev. R. Caldwell designates as Dravidian—this term comprising, according to him, besides the Tamil, the Telugu; Canarese; Malayālam, or Malayārma; Tul'u, or Tul'ua; Toda, or Tuda, or Tudava; Kōta; Gōnd; and Khond, or Künd, or Ku. "The Tamil language," thus learned author says in his *Comparative Grammar of the Dravidian or South-Indian Family of Languages*, "is spoken throughout the vast plain of the Carnatic, or country below the Ghauts, from Pulicat to cape Comorin, and from the Ghauts, or central mountain-range of southern India, to the bay of Bengal. It is also spoken in the southern part of the Travancore country, on the western side of the Ghauts, from cape Comorin to the neighborhood of Trivandrum; and in the northern and north-western parts of Ceylon, where Tamilians commenced to form settlements prior even to the Christian era, and from whence they have gradually thrust out the Singhalese. All throughout Ceylon, the coolies in the coffee-plantations are Tamilians; the majority of the money-making classes even in Colombo are Tamilians; and ere long the Tamilians will have excluded the Singhalese from almost every office of profit and trust in their own island. The majority of the domestic servants of Europeans, and of the camp-followers in every part of the presidency of Madras being Tamil' people, Tamil' is the prevailing language in all military cantonnments in southern India, whatever be the vernacular language of the district; hence, at Cannanore, in the Malayāla country; at Bangalore, in the Canarese country; at Bellary, in the Telugu country; and at Secunderabad, where Hindustani may be considered as the vernacular, the language which most frequently meets the ear in the bazaar is the Tamil. The majority of the *Klings*, or Hindus who are found in Pegu, Penang, Singapore, and other places in the further east, are Tamilians. . . . Including Tamilians resident in military stations and distant colonies, and the Tamilian inhabitants of s. Travancore and northern Ceylon . . . the people who speak the Tamil' language may be estimated at *about ten millions*." "Tamil' includes two dialects, the classical and the colloquial, or the ancient and the modern, called respectively the Shen-Tamil' and the Kod'un-Tamil'. The former is the language of poetry and of the ancient inscriptions; it contains fewer words borrowed from the Sanskrit than the colloquial Tamil', and among these chiefly such as express abstract ideas of philosophy, science, religion, and technical terms of the more elegant arts; and, in general, it so considerably differs from the colloquial Tamil' that it is almost unintelligible to the unlearned Tamilian. Of all the Indian languages, Tamil' has the most imperfect alphabet. The latter consists of 12 vowels—viz., *a, ā, i, ī, u, ū, e, ē, o, ō, ai, au*—and of 18 consonants—viz., *k, ch, t, l, p, R, ng, ñ, n', n, m*, a final

n, y, r, l, v, r', l'. Compared to the Devanāgarī alphabet of Sanskrit, it is deficient therefore in the vowels *r'i, r'i,* and *l'i,* though it possesses a short *e* and a short *o*, which the Devanāgarī has not; it has but one sound for *k, kh, g, gh;* for *ch, chh, j, jh;* for *t, th, d, dh;* for *t, th, d, dh;* and for *p, ph, b, bh.* It is destitute, moreover, of the Sanskrit aspirate *h,* of the Sanskrit sibilants, *s, s',* and *sh,* and of Anuswara and Visarga. Of combined consonants, which abound in the Devanāgarī alphabet, it admits only the junction of the nasal and the mute, as *n-t, n'-t',* etc.; doubled nasals, as *n-n, m-m,* etc.; doubled surds, as *k-k, ch-ch,* etc.; also *t'k, t'p, Rk, Rch, Rl, Rv, yy, ll, vv,* and *nR;* of triple consonants, only *r'nd* and *ynd.* If Sanskrit derivatives, therefore, are Tamilized, various devices are resorted to in order to separate Sanskrit groups of consonants. Thus, Sanskrit *pra* becomes Tamil *pīra;* Sanskrit *krishn'a* becomes Tamil *kirut'tīna-n* or *ki'l'tīna-n* (*t't* instead of *sh*).

The earliest history of the Tamil' country is still involved in obscurity. From evidence afforded by the language, Dr. Caldwell has drawn a sketch which would tend to show that the un-Aryanized Tamil'ians had "kings," who dwelt in "fortified houses," and ruled over small "districts of country;" that they had "minstrels," who recited songs at festivals; but that they were without "hereditary priests," without idols," and ideas of "heaven, hell, soul, or sin;" yet that they acknowledged the existence of God, whom they styled *kō,* or king, and erected to his honor a temple which they called *kō-il,* or God's house. Their chief worship, however, seems to have consisted in bloody sacrifices which they offered to "the devil." Dr. Caldwell further shows that they were acquainted with the ordinary metals, except tin and zinc, and with the planets known to the ancients, except Mercury and Saturn; that they had medicines, hamlets, towns, ships, and practiced the necessary arts of life, such as cotton-weaving and dyeing, though none of the arts of the higher class, as painting, sculpture, etc.; that they knew no astronomy, and were ignorant of philosophy and grammar. The earliest civilization of the Tamil'ians is traditionally attributed to the influence of successive colonies of Brahmans from upper India; and the leader of the first colony is said to have been the Rishi (q.v.) or saint *Agastya,* a personage who plays an important part in Brahmanical legends. He is called the first king of the Pāndiya kingdom, which was situated near the southern extremity of the peninsula; and by the majority of orthodox Hindus he is believed to be still alive, though invisible to ordinary eyes. His era is supposed to belong to the 6th c. B.C.; though, like all other ancient Hindu dates, this date, too, cannot be fixed with any degree of certainty. Whether the Vedic worship (see VEDA) was ever known in the Tamil' country may be matter of doubt; the worship introduced by the Brahmans seems, on the contrary, to have been that based on the incarnations of Vishnu (q.v.) and S'iva (q.v.), and therefore to belong to an advanced stage of Hinduism. Vaishnavas, Saivas, and Śāktas (see INDIA) are the now prevalent sects of the Tamil' country; for the Jains (q.v.), who flourished in the Pāndiya kingdom, probably from the 8th or 9th c. to the 12th or 13th after Christ, were finally expelled from it; and only a few adherents of this sect may now be met with there.

The oldest Tamil works are, however, those written, or claimed to have been written, by the Jains; and it is a remarkable fact that at any period of Tamil' literature few Brahmans have contributed anything to it that may be deemed worthy of preservation. The finest composition which Tamil' possesses is the *Kuṛal* of Tiruvalluvar, "a work consisting of 1330 distichs or poetical aphorisms, on almost every subject connected with morals and political economy." Dr. Caldwell holds that it is not later than the 9th c. after Christ. A commentary on this work by Parimelagar is the most classical production which has been written in Tamil' by a Brahman. Besides the *Kuṛal*, the following works are said to have received the sanction of the Madras college, which, according to tradition, founded by Vamsa Sekhara for the cultivation of the Tamil' language and literature, was then probably the most celebrated seat of learning in all Hindustan. Their names are: *Naladiyar, Nanmanikkadikai, Iniyavai Narppatu, Inna Narppatu, Kar Narppatu, Kallavali Narppatu, Lokai, Tirikadukam, Asava Koeai, Puli Moli, Siru Pensa Mulam, Mutu Moli Kanji,* and *Eluti.* For a list of other and later works written in Tamil', both mediæval and modern, embracing the topics of religion—Protestant theology, Roman Catholic theology, Hinduism, and books published by Mohammedans—jurisprudence, philosophy, science, arts, literature, philology, geography and history, periodicals and newspapers, see the very useful *Classified Catalogue of Tamil'-printed Books, with Introductory Notices,* compiled by John Murdoch (Madras, 1865); and for learned purposes, the invaluable *Comparative Grammar of the Dravidian or South-Indian Family of Languages,* by rev. R. Caldwell (Lond. 1856).

TAMMANY, SOCIETY OF. Societies bearing this name in honor of a Delaware chief who died in the latter part of the 18th c., were about that time established in Philadelphia, New York, and other cities; but that organized in New York, May 12, 1789, was the only one that survived and still exists. This society, originally charitable, became diverted to political uses; and, in the hands of the democratic party, grew to be the recognized head of that organization, and to occupy a position in local elections which, ultimately, became apparently impregnable. The connection of many of its members with the "Tweed ring" scandal brought it into disrepute, though it regained much of its former power as the memory of that incident died away. The political struggle of 1880 again sapped its strength.

The Tammany society made its headquarters for many years in a building which occupied the site of the New York *Sun* building on Park row. It eventually erected its present building in East Fourteenth street, where its meetings take place in a commodious public hall, a smaller room in the structure being used as a German theater. The society has a committee in every assembly district in the city, and a central committee, numbering more than 1000 members. The latter committee controls the nominations, and, to a large extent, the party-vote in the city, and, to some degree, throughout the state.

TAMMERFORS, a t. in the s. of Finland, 250 m. (direct line) w.n.w. of St. Petersburg. It is situated on a rapid which connects two lakes, and affords motive-power to an extensive cotton mill employing a large number of hands. There is also a large flax mill, a fine stocking manufactory, and a paper mill. Pop. '67, 5,538.

TAMMUZ, a word which occurs once in the Bible—viz., Ezek. viii. 14: "And behold, there sat women weeping for Tammuz." The derivation of the word is as problematic as is the meaning itself. The Vulgate (all the other versions give the word unchanged—thereby confessing the universal ignorance on the subject) has Adonis, and this has indeed been accepted as the most credible explanation of this strange name. It probably means the Phenician god Adonis, whose chief temple and worship was at Byblus, but who at an early period had been introduced into Syria, Cyprus, and Greece, where he was connected with Aphrodite. His festivals were partly the expressions of joy, partly of mourning. In the latter the women gave themselves up to the most unmitigated grief over the "lost Adonis," shaved off their hair, and sacrificed their chastity in his temples. The days of mourning were completed by a solemn burial of an image of the god. This period was followed by a succession of festive and joyful days, in honor of the resurrection of Adonis. The river Adonis (Nahr Ibrahim) (see PHENICIA), which once a year "ran purple to the sea" from the Lebanon, was supposed to be tinged by the blood of the god; and a vessel sent off from Alexandria, and carried by the tide to Byblus, used to inform the mourners by letter that he had been found again. There is no doubt that the different phases of the year, or rather the disappearance and reappearance of the enlivening rays of the sun, and their influence upon all nature (see OSIRIS), were symbolized in these originally poetical, afterward licentious and fanatical rites. The time of the year at which these feasts were celebrated has given rise to much dispute. Most probably, they took place at the summer solstice; and the designation of a Hebrew month as Thamuz—which falls about our August—seems further to favor this opinion.

TAMMY, a thin worsted stuff, highly glazed. It is much used for ladies' boots, under the name of *lasting*; it is also called *durant*. It is also used, undyed, to form sieves for use in cooking to strain sauces. Such sieves are called tamnies, or tamis.

TAMP, TAMPING. See MINES and BLASTING.

TAMPA BAY, on the w. coast of Florida; an inlet from the gulf of Mexico; 40 m. long, and varying from 6 to 15 m. in width, the n. part being divided into old Tampa and Hillsboro' bays. Its entrance is protected by a line of keys, or low islands, and it forms an excellent harbor. It contains a number of small islands, and fish and turtle in great abundance.

TAMPAN, a tick (q.v.) of s. Africa, remarkable for its very poisonous bite, found in Angola and the country southward from it, and described by Livingstone in his *Travels*. It attacks by preference the parts between the fingers or toes. It attains the size of a pea, and when it has satiated itself with blood, is of a dark-blue color, and its skin so tough, that it cannot be burst by squeezing with the fingers. The first effect of the bite is a mingled sensation of pain and itching, which ascends the limb until it reaches the abdomen, and soon causes either violent vomiting and purging, or fever. The tingling sensation lasts for a week.

TAMPI CO. or Santa Anna de Tamaulipas, a sea-port of Mexico, in the state of Tamaulipas, on the Panuco, 5 m. from its mouth in the gulf of Mexico. Its streets are broad and regular, and among other institutions it contains a custom-house. At the mouth of the river is a dangerous bar, and the harbor is unsafe. Hides, tallow, bones, and salted meat are exported to Great Britain and the United States. The annual imports amount to about £668,000; the exports—greatly reduced within recent years by the state of anarchy and confusion into which the country has been plunged—to £235,000.

TAMPION, the wooden plug placed in the mouth of a piece of ordnance to preserve it from dust and damp.—In naval gunnery the tampion is the wooden bottom for a charge of grape-shot.

TAM-TAM, an Indian musical instrument, resembling the tamborine (q.v.), but larger and more powerful, and oval instead of round. It has been occasionally introduced into orchestral bands.

TAMUS. See BRYONY.

TAMWORTH, a parliamentary and municipal borough, partly in the county of Stafford, partly in that of Warwick, at the confluence of the Tame and Anker, 7 m. s.e. of Lichfield. Of the ancient church, the transepts are Norman; the remains of the ancient castle, to which modern additions have been made, are in various styles. Brickmaking, brewing, dyeing, wool-stapling, and manufactures of tapes and small wares are carried

on. There is a bronze statue to the late sir Robert Peel, erected in 1852. Pop. '71 of municipal borough, 4,589; of parliamentary borough, 11,493.

TAN'AGER. *Tanagra*, a genus of birds of the finch family *fringillidae*, having a conical beak, triangular at the base; the upper mandible notched toward the tip, and its ridge arched. The species are numerous, and the Linnæan genus has been divided into a number of genera, all of which possess the characters just given, and popularly receive the name tanager. All of them are American, and most of them belong to warm regions; but some visit more northern parts of America as birds of passage. Many of the tanagers are birds of very beautiful plumage, and many have good powers of song. The **ORGANIST TANAGER** (*T. or euphonia musica*) is particularly famous for its rich full tones.

TANAKA FUJIMARO, b. in the province of Owari, Japan, about 1843. During the revolution of 1868 was one of the leaders in the cause of progress. He was made vice-minister of education in 1871, and visited America and Europe on an educational mission. On his return to Japan he zealously devoted himself to perfecting a plan of national education by which nearly 3,000,000 Japanese youth of both sexes now attend public-school. In 1876 he again visited the United States to observe the system of education, representing Japan's educational progress at the Centennial exposition. On his return to Japan he established in Tokio a museum of education to which American schools and educators largely contributed. In 1879 he was made minister of justice.

TANANARIVA'. See **ANTANANARIVA**.

TAN-BALLS. A useful way of utilizing the spent bark of the tanner's yard has been adopted in many parts of England: it consists in pressing the bark into balls or lumps, which harden on drying, and serve for fuel.

TANCRED, a Sicilian prince, the son of Endes, a Norman baron, and of Emma, the sister of Robert Guiscard (see **GUISCARD**), was one of the celebrated heroes of the first crusade, and was born after the middle of the 11th c. A.D. Some chroniclers profess to detail the events of his early life, describing him as the most accomplished youth of his time in athletic and military exercises, and of a wisdom far surpassing that of men of mature years, and as a partisan of his cousin Bohemond (q.v.) in the quarrel with their uncle, Roger (q.v.) of Sicily. But the first authentic information respecting him is that he raised a large body of men in Apulia and Calabria, and joined Bohemond, then on his way to the first crusade. The two cousins landed in Epirus, and first one and then the other made their submissions to the Greek emperor, Alexis. Tancred's exploits on the way to Syria; his quarrel with Baldwin for the possession of Tarsus, and his subsequent chivalrous forbearance to, and rescue of, his rival; his wondrous valor before Antioch, where he killed no fewer than 700 infidels, transmitting the heads of 70 to the pope, and received a corresponding number of marks of silver in return; his vigorous repulse of the first sortie by the infidels from Jerusalem; his sad and lonely vigil on the mount of Olives; and his gallantry at the storming of the sacred city, are all detailed by the numerous chroniclers of this epoch, in their usual style of extravagant laudation, but with a harmony which speaks favorably for their correct appreciation of his character. He was one of the claimants of the throne of Jerusalem, and was pacified by Godfrey (q.v.), the successful competitor, with the gift of some towns in Palestine, and the principality of Galilee or Tiberias. A brief quarrel with Baldwin, after Godfrey's death, petty combats with the infidels, and occasional wars with the other Christian princes who had settled in Syria and Palestine, occupied the remainder of his life, which was brought to a close at Antioch in 1112. Besides his own principality, he governed that of Antioch, belonging to his cousin Bohemond, from 1100. The fiery and energetic, but at the same time pious, sagacious, and forbearing chief whom the chroniclers present to us has been considerably toned down by Tasso in his *Gerusalemme Liberata*.

TANEY, a co. in s. Missouri, adjoining Arkansas; drained by White river and several creeks; 750 sq.m.; pop. '80, 5,633—5,614 of American birth, 4 colored. The surface is rough, heavily wooded, and moderately fertile; corn, wheat, hay, and pork are the products. Copper and lead are found. Co. seat, Forsyth.

TANEY, ROGER BROOKE, LL.D., 1777-1864; b. Md.; graduated at Dickinson college, Penn., 1795; studied law, and in 1799 was admitted to the bar. He practiced in Calvert co. and Frederick, removing to Baltimore in 1822. He was attorney-general of the state in 1827, and in 1831 president Jackson made him attorney-general of the United States. Two years later he was nominated to succeed Duane as secretary of the treasury, but on account of his opposition to the U. S. bank the appointment was not confirmed by the senate. The senate also refused, 1835, to confirm his appointment to the supreme court bench, but two years later he succeeded chief-justice Marshall and ably sustained the high reputation for legal profundity and acumen which the supreme court had gained under his immediate predecessor, though the events of the war have overthrown many of the positions then taken. Many most important decisions on constitutional questions were given by him, the most noted being that in the "Dred Scott" case (q.v.). This decision, with the accompanying expression of opinion, had much to do with the discussions and animosity which resulted in war. When in the spring of 1861 application was made to Taney for a writ of *habeas corpus* in the case of a Baltimore citizen who had been arrested by a U. S. officer on a charge of treason, he at once granted it,

denying the right of the president to suspend the *habeas corpus* act. A memoir of Tancy's life, in part an autobiography, was published, 1872, by prof. Samuel Tyler. A bronze statue of him, executed by Rhincharlt for the state of Maryland, stands in the city of Annapolis.

TANGANYIKA, a lake of eastern central Africa, lying between lat. 3° and 8° 45' s. Long. of center, 30° e.; surface, 2,710 feet above the sea; length, 350 m.; breadth, from 15 to 60 miles. It was discovered by Speke and Burton in 1858. In 1871 Livingstone confirmed Burton's conclusion, that the Rusi Zi flows into its n. extremity. Cameron surveyed the s. and w. coasts in 1874, and discovered an outlet, the Lukuga, on the w. side. In 1876 Stanley satisfied himself that this channel, which he proved to communicate with the Lualaba or upper Congo, is generally dried up in certain parts of its course, and only carries the overflow of Tanganyika westward at intervals of years.

TANGENT. See TRIGONOMETRY.

TANGHIN. *Tunghinia venenifera*, or *cerbera tanghin*, a tree of the natural order *apocynaceæ*, a native of Madagascar. The fruit is a drupe, of which the kernel is so deadly a poison, that although not larger than an almond, one kernel is sufficient to destroy twenty people. It was used in Madagascar as an ordeal for the discovery of guilt or innocence, and with the general result of the death of those subjected to it. A little of the powdered kernel was placed on the tongue of the suspected person, and he was obliged to swallow it. Only those recovered whose stomachs quickly rejected the dose. The progress of Christianity and civilization in Madagascar has led to a discontinuance of the use of this ordeal. A similar poison-ordeal is used in some parts of Africa. See ORDEAL and ERYTHROPHLEUM.

TANGIER, a sea-port of Morocco, on a small bay or inlet of the strait of Gibraltar. 38 m. s.w. of the town of that name. It is a small, ill-built town, situated on two hills; the houses—with the exception of the residences of foreign officials—being, as a rule, miserable edifices, and the streets being narrow and dirty. The town is surrounded by old walls and protected by several forts. It has an extensive shipping trade—the annual value of the entering and clearing cargoes being, according to recent accounts, above £600,000. Tangier was taken by the Portuguese in 1471, ceded to the English in 1662, and held by them for 22 years. Pop. about 9,500.

TANGIPAHOA, a co. in s.e. Louisiana; bounded on the n. by Mississippi, on the s. by lakes Pontchartrain and Maurepas; drained by the Tangipahoa river; traversed by the Chicago, St. Louis and New Orleans railroad; about 725 sq.m.; pop. '80, 9,633, 4,035 colored. The surface is flat. The soil is sandy but fertile in some parts. The principal productions are corn, rice, potatoes, and cotton. Co. seat, Amite City.

TANGLE, the common name of *laminaria digitata* and *l. saccharina*, two species of sea-weed, natives of the British shores, growing on rocks in deep water. The stem is woody, the frond leathery, flat, and without a midrib. The woody stems are sometimes used for knife-handles, the blade being stuck in when the handle is soft, and held fast by its shrinking as it dries. The young stalks form an article of food and are nutritious, owing apparently to the large quantity of gelatinous matter which they secrete. They are also used for feeding cattle. *L. potatorum*, a large species, supplies the aborigines of Australia with instruments, vessels, and food.

TANIS, the Tyrian name of the goddess Astarte (q.v.).

TANISTRY, an ancient Celtic custom of succession, which is generally described as devolving the right to inherit lands or honors on the oldest and worthiest of the blood. The tanist, or righdomna, was the heir-apparent of the monarchy, whom it was the practice to appoint during the lifetime of the sovereign; and there is no doubt that the nearest to the original stock was held to have a preferable claim, as contended by Bruce in his claim to the Scottish throne. The practice of electing a successor was also applied to the inheritance of land, and to succession to ecclesiastical offices.

TANJUR, more commonly written TANJORE, an important town of India, in the presidency of Madras, 180 m. s.s.w. of the city of that name, in the midst of an extensive plain, on one of the branches of the delta of the Kaveri. The town comprises two forts and several suburbs. The former are so connected that they may almost be regarded as one. The smaller of the two is a parallelogram in shape, and 600 yards in extreme length. It is joined on the north to the larger fort, which is circular in shape, and 1100 yards in greatest diameter. The walls of both are lofty and strong, and are surrounded by a ditch cut out of the solid stone. The principal edifices of Tanjur are the great pagoda, esteemed the finest specimen of a pyramidal temple in Hindustan (see INDIAN ARCHITECTURE), and the palace of the rajah. Silks, muslins, and cottons are manufactured. Pop. '71, 52,175. The province of Tanjur, of which the town of the same name is capital, has an area of 3,735 sq.m., and contained, in 1871, 1,975,042 inhabitants.

TANK-WORMS. The mud in Indian tanks has been found to abound in *filaria*, some of which closely resemble the guinea-worm infesting the human body. Although there is no positive evidence, there is extreme probability that these tank-worms are the origin

of the guinea-worm. Dr. Carter, who has had much personal observation of the guinea-worm in India, "argues, and apparently with good reason, *no tank-worm, no guinea-worm*. Persons who bathe in water in which the former is found may expect to have the latter." Mr. Bastian, who has written an excellent paper on the anatomy of the guinea-worm, states that there is an undoubted anatomical relation between it and the tank-worm. The real difficulty in the theory is that these tank-worms are widely diffused, while the guinea-worm is restricted in its localization.

TANNAHILL, ROBERT, was b. on June 3, 1774, at Paisley, where his life was almost entirely passed in the humble occupation of a weaver. Very early he exhibited a taste for poetry, and out of his constant study of the works of Burns, Ferguson, and Ramsay, the ambition was developed in him of emulating these favorite authors. His poetry soon became known, and procured him a local celebrity, which on the publication, in 1807, of a collection of his pieces (*Poems and Songs*; new and larger ed., with a memoir of the author, Glasgow, 1838), was ratified by a wider acceptance. But while his modest fame was extending itself, his life had an abrupt termination. He was found one morning (May 17, 1810) drowned in a canal near Paisley; and there seems almost no reason to doubt that his death was that of the suicide. A morbid melancholy which seems to have been inherent in his nature had gradually been growing upon him, and clouding his life with hopeless gloom. He died at the age of 36.

As a song-writer, Tannahill continues to be remembered; and some few of his best pieces have established themselves as part of the musical repertory of the Scottish people. He has a genuine lyrical gift, much tenderness of sentiment, and a true eye and feeling for the simple effects of nature with which he was familiar. Of the force and passion of Burns, he has nothing; but in grace and sweetness, Burns himself has scarcely perhaps surpassed certain of his happier passages.

TANNHÄUSER, the subject of one of the most attractive German legends of the middle ages, is a knight who, in the course of his travels, comes to Venusberg (q.v.), and enters the cave-palace, to behold the wonders of the lady Venus and her court. After having lived there for some time in every kind of delight, his conscience smites him. Invoking the Virgin Mary, he obtains leave of absence, and makes a pilgrimage to Rome, to pope Urban, to seek, through confession and penance, remission of his sins, and escape from damnation. But the pope, who happens to have a wand in his hand, tells him that he can as little obtain God's mercy as that dry wand can become green again. Thereupon Tannhäuser departs in despair, and returns to the lady Venus in the mountain. Three days afterward, however, the wand begins to sprout and bear green leaves; and the pope immediately sends out messengers to every country, but in vain—Tannhäuser can nowhere be found. Such is the story as told in the popular ballad once common all over Germany, and even beyond it, and sung in the district of Entlibuch as late as the year 1830—the best version of which is in Uhland's *Alte hoch- und niederdeutschen Volkslieder* (Stuttg. 1845). In the preface of the *Heldenbuch*, it is further added, that "the faithful Eckhart"—a character in German heroic legends—sits before the mountain, and warns the people of its dangers. In this shape, the story may be traced as far back as the 14th c.; but the substance of the legend is much older, and goes back to the days of German paganism. Some traditions connect it with the Hoeselberg or Hörselberg, near Eisenach, in which the lady Holle or Holda (see BERCHTA) held her court, who, on her part again, seems to be identical with Freyja, the Scandinavian Venus. The peculiar mythological meaning of the saga, which has numerous points of contact with many other German traditions, has, however, never yet been thoroughly inquired into. Grimm sees in it a touching portrayal of the regret that lingered in the popular heart after the departing paganism, and of the sternness of the Christian priesthood in regard to it. Compare Kornmann, *Mons Veneris* (Fkf. 1614); Grässe, *Die Sage vom Ritter Tannhäuser* (Dres. and Leip. 1846). In later times, the saga has been put into poetical form, among others by Tieck, and made use of by R. Wagner in an opera. This idea of subterranean palaces in which the king or queen of dwarfs, pignies, fairies, and so forth, held their court, seems to have been universal. Everywhere, stories are told of men being enticed to enter, and finding it difficult or altogether impossible ever again to obtain their liberty. See RHYMER, THOMAS. The visit of Ulysses to the isle of Calypso, and that of Circe, appear to be only modifications of the same idea.

About the middle of the 13th c., and contemporary with pope Urban (Urban IV., 1261-65), there lived in reality in Germany a Bavarian knight named Tannhäuser, who, as Neidhart relates, after returning from the wars, resided as minnesinger (q.v.) at the court of the Austrian duke Frederick II. the quarrelsome. At the duke's death, and after having wasted his substance in dissipation, he resided partly with duke Otto II. of Bavaria, and partly led a wandering life. Tannhäuser has composed fine spirited ballads, which, however, show the decay that had already set in in the minnesinger's art. Tannhäuser's memory was held in high regard by the meistersingers, who also preserved one of his measures; and it is quite possible that this Tannhäuser may have been introduced into popular fiction, and have had his name worked into a myth, in which there is some resemblance to his actual fortunes; in which process, however, that old myth became transformed into the more modern saga. The poems of Tannhäuser are published partly in the second part of the *Minnesinger* (published by Von

der Hagen, Leip. 1838), and partly in the 6th vol. of Haupt's *Zeitschrift für Deutsches Alterthum* (Leip. 1848).

TANNIC ACID, or **TANNIN**. Under these synonymous terms, chemists include a number of solid non-nitrogenous substances, consisting of carbon, hydrogen, and oxygen, some of which are crystalline, and others amorphous, and possessing no smell, but a well-marked astringent taste. They are soluble in water and alcohol, the solutions being acid, and yielding precipitates with most metallic oxides. A solution of gelatine is also precipitated by a solution of any of the tannic acids, and the gelatinous tissue in raw hides is by an analogous process converted into leather. See **GALLOTANNIC ACID**. None of these acids are volatile; and when exposed to the action of heat, they decompose, and yield the so-called pyro-acids. The persalts of iron yield bluish-black or green precipitates with the tannic acids.

The members of this group are widely diffused throughout the vegetable kingdom. "The bark and leaves of most forest trees, such as the oak, the elm, the willow, the horse-chestnut, and the pine—and of many fruit trees, such as the pear and plum, contain tannin in notable quantity. The wood and bark of many shrubs, such as the sumach and whortleberry, and the roots of the tormentilla and bistort, are also powerfully astringent, owing to the presence of one of the forms of tannin. Coffee and tea, as well as Paraguay tea, likewise contain a modification of this principle. All these bodies, except coffee, precipitate the persalts of iron of a bluish-black color; or, if a free acid be present, the solution assumes a dark-green color."—Miller's *Organic Chemistry*, 2d ed. p. 400. The variety of tannin, or tannic acid, occurring in catechu and kino, produces a green precipitate with the persalts of iron; while that occurring in matricaria, rhatany, and the common nettle, produces a gray precipitate. The principal members of this group are—1. *Gallotannic acid*, or *tannic acid*, $C_{54}H_{22}O_{34}$ (in the ordinary acceptation of the word), which is mainly obtained from the gall-nut, and has been described in a special article; 2. *Moritanic acid*, $C_{36}H_{16}O_{26}$, obtained from fustic (*morus tinctoria*); 3. *Quinotannic acid*, $C_{26}H_{10}O_{17}$, obtained from cinchona bark; 4. *Quercitanic acid*, from oak bark; 5. *Mimotannic acid*, $C_{54}H_{22}O_{34}$, from catechu; and 6. *Kinotannic acid*, from kino; to which some chemists add a variety occurring in coffee and Paraguay tea, to which the term *caffotannic acid* is given.

TANNING. See **LEATHER**.

TANSY, *Tanacetum*, a genus of plants of the natural order *compositæ*, sub-order *corymbifere*, allied to *artemisia* (q.v.), and having hemispherical heads of flowers, with the florets all tubular, the receptacle naked, the pappus a slight membranous border. The species are pretty numerous, and are natives of the temperate parts of the old world. COMMON TANSY (*T. vulgare*) is a native of Britain and of continental Europe, growing in fields and by roadsides, river-banks, etc. It has long been generally cultivated in gardens. It is now naturalized, and pretty common in many parts of North America. It is a perennial, from two to four feet high, with great abundance of deep-green, bipinnatifid, inciso-serrate leaves; the flowers in terminal corymbs, yellow, and rather small. The leaves and flowers have a strong aromatic smell and a bitter taste. The young leaves are used for flavoring puddings, cakes, omelets, etc. The plant is also tonic and anthelmintic, and *tansy tea* is an old popular medicine. Some curious old customs still linger in many parts of England connected with the use of *tansy cakes* and *tansy puddings* at Easter, which was originally intended to represent the use of bitter herbs at the paschal feast. In some parishes of the counties of Devon and Dorset the clerk carries round to every house a few white tansy cakes as an Easter offering after divine service on Good Friday, and receives a gratuity from each householder. In former times both ecclesiastics and laics played at ball in the churches for tansy cake at Easter-tide. The highest dignitaries took part in this, and began the ball-playing, which went on during the antiphone, and was accompanied with dancing. After the ball-playing was over, all retired for refreshments; and a gammon of bacon was a standard dish, to signify abhorrence of the Jews. A tansy pudding was an essential part of the feast.—See Chambers's *Book of Days*.

TANTALUM (symb. Ta, new equiv. 182) is a very rare metal, discovered in 1802 by Ekeberg in the Swedish minerals known as tantalite and ytrotantalite. It is so closely allied to columbium or niobium that Wollaston regarded the two metals as identical, a view which was generally adopted till Rose disproved it. As it is of no practical importance, it is unnecessary to enter into any details regarding it.

TANTALUS, a genus of birds of the family *ardeiæ*, resembling storks in their feet and bill, except that the ridge of the bill is rounded, and its tip gradually curved downward, and slightly notched on each side; a portion of the head, and sometimes of the neck, is bare. The AFRICAN TANTALUS (*T. ibis*) was long regarded as the *ibis* (q.v.) of the ancient Egyptians, but it is rare in Egypt, and belongs chiefly to Senegal. It is much larger than the true ibis. The AMERICAN TANTALUS, or WOOD IBIS (*T. leucator*), is as large as a stork, but more slender, white, with black quill and tail feathers, the naked skin of the head and neck black. It is found both in North and in South America. In the United States it chiefly inhabits the swampy districts of the south.

TANTALUS, a character noted in Greek mythology for the punishment he suffered in the lower world. He is said to have been the son of Zeus by Pluto, and some accounts describe him as king of Argos or Corinth. Various reasons are assigned for his undergoing the severe punishment which he did, the most common being that he divulged the divine counsels of Zeus, which the latter had communicated to him as secrets. In the lower world he was afflicted with an insatiable thirst, and had to stand up to the chin in a lake, the waters of which receded whenever he tried to drink of them. Clusters of fruit hung over his head, which eluded his grasp whenever he endeavored to reach them, his mind at the same time being kept in a state of constant terror lest a huge rock, suspended above his head, and ever threatening to fall, should crush him. Tantalus, or rather the punishment which he suffered, has supplied the English language with the very significant verb, "tantalize." Tantalus was the father of Pelops, Broteas, and Niobe.

TANTRA (from the Sanskrit *tan*, to believe, to have faith in; hence, literally, an instrument or means of faith) is a name of the sacred works of the worshippers of the female energy of the god Śiva. See ŚĀKTAS. A Tantra is said to comprise five subjects—the creation and destruction of the world, the worship of the gods, the attainment of all objects, magical rites for the acquirement of six superhuman faculties, and four modes of union with spirit by meditation. A variety of other subjects, however, are introduced into many of them, while some are limited to a single topic, as the mode of breathing in certain rites, the language of birds, beasts, etc. They always assume the form of a dialogue between Śiva and his wife, in one of her many forms, but mostly as *Umā*, or *Pārvatī* (q.v.), in which the goddess questions the god as to the mode of performing various ceremonies, and the *mantras*, or prayers and incantations to be used in them. These he explains at length, and under solemn cautions that they involve a great mystery, on no account whatever to be divulged to the profane. The efficacy of these *mantras* is deemed to be all-powerful, and, according to some Tantras, that of the faith in these revelations of Śiva so great, as to free a believer from the consequences of even the most atrocious sins. The followers of the Tantras profess to consider them as a fifth Veda (q.v.), and attribute to them equal antiquity and superior authority. Though such an antiquity, or even one approaching the age of the four Vedas, is entirely imaginary, the question of their date is nevertheless involved in obscurity. As Tantras are referred to in some of the *Purāṇas* (q.v.), they must have preceded these; but as, on the one hand, the age of the *Purāṇas* themselves is merely conjectural, and as there probably existed older *Purāṇas* than those we possess now; and, on the other hand, as there might likewise have been older Tantras, from which the works now so called were compiled, the circumstance that Tantras are quoted by some *Purāṇas* would not throw much light on the date of those now extant. It seems more significant, however, that the oldest known author of a glossary of classical words, Amarasinha (see *lexicography*, under SANSKRIT LITERATURE), should have omitted from among the meanings he assigns to the word *tantra*, that of "a sacred book;" whereas the later commentators on his work do not fail to supply this omission, which certainly would have been an extraordinary one had Tantras existed at the time of Amarasinha. If, then, this negative evidence has the value which it seems to have, the Tantras would, at all events, be later than the first centuries of the Christian era. The works of this class are very numerous, and it is to be regretted that Sanskrit philology, which has already investigated, more or less profoundly, nearly all the branches of Sanskrit literature, should hitherto have almost entirely neglected this particular branch of it. The principal Tantras are the *Syādnārāhasya*, *Rudrayāmala*, *Mantramahodadhī*, *Sāradātīlaka*, and *Kālikātānttra*.—See H. H. Wilson, *A Sketch of the Religious Sects of the Hindus*, Works, vol. i., edited by Dr. Rost (London, 1862).

TANTUM ERGO, the hymn uniformly sung in the Roman Catholic church at benediction with the holy sacrament. These are the first words of the penultimate strophe of the hymn *Pange Lingua*. The *Tantum Ergo* is the most popular of all the eucharistic hymns of the Roman Catholic church.

TANZIMAT, or TANSIMAT, the plural of the Arab word *tansim*, generally signifies "regulations," but in a special sense denotes the organic laws established by the Hattı-Sherif of Gulhane, in accordance with which the administration of the Turkish empire is carried on. These organic laws, the first attempt at constitutional government in Turkey, were published by Sultan Abdul-Medjid in 1844, and treat of—1st, the political organization of the empire, and the powers and jurisdiction of the chief officials and higher courts; 2d, administration and finance; 3d, justice; 4th, military affairs. But the tanzimat was a dead letter, or nearly so, except in connection with the army; so that on Sept. 7, 1854, the sultan found it necessary to publish a new ordinance, in which the complete carrying out of the tanzimat in all respects was commanded; and a commission was appointed to see that this was done.

TAORMINA (anc. *Taurromenium*), a t. on the e. coast of Sicily, province of Messina, situated on a narrow ledge of rock, 900 ft. above the sea, about 30 m. s.w. of Messina. It consists mainly of a single street, more than a mile in length, is surrounded by a Saracenic wall, has numerous convents and churches, many picturesque palaces and mansions built in the middle ages, and numerous relics of antiquity, among

which are very fine supulchers, an aqueduct, tessellated pavements, remains of a "Naumachia" and of a theater, the last reckoned one of the most splendid ruins in Sicily, and commanding a view of almost unparalleled magnificence. Taormina has some trade in wine and hemp, and a pop. '72 of 2,004.

Ancient *Tauromenium* was built after the destruction of Sicilian Naxos in 403 B.C., but the exact date is uncertain. It rapidly attained prosperity; but its history during the Greek and Roman period presents no striking features.

TAOS, a co. in extreme n.w. New Mexico, adjoining Colorado; drained by the Rio Grande and Rio de Chaco rivers; 7,500 sq.m.; pop. '70, 12,079. The surface is crossed by the Sierra San Juan and other mountain ranges, and comprises the southern part of what is known as the San Luis park; wheat, corn, pork, and wool are the staples. Co. seat, Fernandez de Taos.

TAPAJOS, an important river of Brazil, and an affluent of the Amazon, is formed by confluence of the Arinos and the Juruena, both of which rise in the south of the province of Matto Grosso. After a northward course of upward of 1100 m. in length the Tapajos falls into the Amazon, about 20 m. below the town of Santarem. In lat. about 7°30' s., it has a fall of 30 ft.; but the interruptions to the navigation, which is said to reach to within a short distance of the source of the river, are few. A portage of only 18 m. separates the upper waters of the Tapajos from those of the Paraguay.

TAPESTRY (Fr. *tapisserie*), a kind of carpet-work for decorating walls and furniture. The art of working tapestry is extremely ancient, but we have little information about it until the time of the Saracens, who revived it, and brought it into notice. They, in all probability, only used tapestry as drapery or curtains for the courts of their houses; its use as a covering for walls seems to have been an invention of the Flemings previous to 1606, at which date it was introduced into France by Henry IV., who engaged Flemish artists to teach it. At that period, so generally was its origin attributed to the Saracens that it was called *Sarrazinois*. The oldest piece in existence is that described under the name of the BAYEUX TAPESTRY (q.v.). At first, the Saracenic tapestries were only ornamented with flowers and geometric figures; but the Flemings aimed higher, and sought to enrich them with historic subjects of the highest order; and so important did this art become, that the most eminent masters in painting, from Raphael downward bestowed their greatest efforts upon cartoons to serve as copies for the tapestry-workers, of which the celebrated Raphael cartoons, formerly at Hampton Court, now in a gallery especially designed for them in the Kensington museum, are illustrations (see CARTOON). After its first introduction into France by Henry IV. at the beginning of the 17 century, the art of making tapestry does not appear to have made much progress until the middle of that century, when a small establishment founded by the brothers Canaye on the premises formerly occupied by Jean Gobelin, a dyer of wool, was commenced, and was afterward carried on by a Dutchman named Gluck and his assistants with such success, that it was suggested by Colbert, the minister of Louis XIV., that it should be taken under the king's patronage; in consequence of which the establishment was bought, and constituted a royal manufactory in 1667, under the management of M. Lebrun, who was the first director. A royal carpet-manufactory had been previously established in 1615; this was called La Savonnerie, from the previous use of the buildings for the manufacture of soap. The Savonnerie and the Gobelins were both carried on with great spirit by successive sovereigns, and were formed into one establishment in 1826, when the works of the Savonnerie were removed to the Gobelins, where this most interesting work is now carried to great perfection, and also at a minor establishment at Beauvais, in the department of Oise, where it is, however, worked in a different style and manner. At the Gobelins, a series of threads are arranged vertically in a frame like the warp of a loom, and the workman stands behind the frame, the pattern being placed behind him for reference. To produce the design, he has a number of wooden needles threaded with wool and silk of the colors required, and these are passed through the upright warp-threads, and brought back, so that each thread becomes covered with the necessary color; and such is the extreme nicety with which this is done, and such the delicacy and multiplicity of the shades of color employed, that but little difference can be detected between the tapestry picture and the painting from which it was copied. At Beauvais, the warp is placed horizontally, and the workman stands over it; this renders it necessary to cut off the ends on the upper surface, which is avoided in the other plan of working from behind. The Beauvais is, however, a style intermediate between tapestry and carpet-work, and the roughness of surface so produced has a good effect. Much fine tapestry was employed in former times in decorating the palaces and mansions of Great Britain, in many of which it is still seen in great beauty. The modern works of the Gobelins were distributed as presents by the late imperial government of France. They are not produced in great numbers, and are of great money value. The number of artists employed is about 120.

TAPEWORM is a word popularly used in a vague sense to designate any worm of the group *cestoides* (see CESTOID WORMS). According to Dr. Cobbold, upward of 250 distinct forms of cestoid worms have been described, of which probably somewhat less than 200 may be regarded as really good species. These he divides into the three families of (1) *teniadae*, or true tapeworms; (2) *bothriocephalidae*, and (3) *tetrarhynchidae*. For the natural

history of the tapeworms generally, we must refer to the article CESTOID WORMS. We will here only remind the reader of the following points necessary for the due understanding of this article, and that every tapeworm passes through several distinct phases during its life-history. "In the ordinary colonial or tapeworm condition," says Dr. Cobbold, "it has been termed the *strobila* (Van Beneden). The separate joints of which the strobila is composed are denominated *proglottides*, or *zooids*. The anterior segment forms the *head*, and remains barren, those of the neck and front part of the body being sexually immature during the process of strobile-formation. The mature proglottides at the caudal end are capable of realizing an independent existence, and the eggs which they contain develop the six-hooked embryos, or *proscolices* (Van Beneden), in their interior. These latter become metamorphosed into *scolices* or *nurses*, representing the well-known cysticercal state, which, in its sterile or aborted condition, forms the common *hydatid*."—*Entozoa*, p. 105. During the greater part of their existence, the tapeworms are parasitic animals, the mature proglottides and eggs being free only during a comparatively short interval. They are mostly restricted in their distribution to the vertebrate animals, comparatively few of the invertebrates (excepting the cuttle-fish) appearing to harbor them in their adult condition, although the tapeworm larvæ, nurses, or *scolices* probably abound in various invertebrate groups. In the human body, no less than ten species of tapeworm occur, viz., eight *true tapeworms*, and two species of *bothriocephalus*; and as four distinct species have been found in the Barbary ape, it is obvious that errors of diet, due to civilization, are not the cause of these parasites. Among the animals with which we are most familiar, the species are plentiful in the common dog (and in true carnivora generally), in rats, and mice. The typical ruminants are almost constantly invested both by mature and immature forms; while the larger pachyderms, and solidungulates (the horse, ass, etc.), harbor only a few adult forms; but only larvæ appear to be known in swine. These worms appear to be as abundant in granivorous birds as in carnivorous hawks, owls, etc. In the water-birds generally, the adult worms are very abundant, their larvæ existing in the food of such birds, in fishes, mollusks, etc. In reptiles, these worms are extremely rare, although other parasitic worms abound; while in fishes they are very abundant both in the adult and larval forms.

The *teniada*, or *true tapeworms*, may be distinguished from the other families of the order *cestoidea* (cestoids or tapeworms in the popular sense) "by the possession of a small distinct head, furnished with four simple oval or round suckorial disks (suckers), and commonly also with a more or less strongly pronounced rostellum (proboscis) placed at the summit in the median line. This prominence, when largely developed, becomes retractile, and when not in use, is lodged within a flask-shaped cavity, lined by a sheath, and supplied with special muscles; it is also very frequently armed with a single or double crown of horny chitinous hooks, there being occasionally as many as five or six separate circular rows of these organs. Attention to the number, relative size, and disposition of the hooks is often sufficient to determine the particular species. In nearly all cases the reproductive orifices are situated at or near the margins of the joints which are bisexual."—Cobbold, *op. cit.*, p. 109. The eight true tapeworms occurring in man are—(1) *Tenia solium*, Linneus; (2) *T. mediocanellata*, Küchenmeister; (3) *T. acanthotriax*, Weinland; (4) *T. flavopuncta*, Weinland; (5) *T. nana*, Von Siebold; (6) *T. elliptica*, Batsch; (7) *T. marginata*, Batsch; (8) *T. echinococcus*, Von Siebold.

The common tapeworm, *tenia solium*, derives its Linnean title from the idea that it is always a solitary worm. Although this is commonly, it is not by any means always the case; Küchenmeister has several times found two or three together, and cases are recorded in which 30 and even 40 worms have been expelled from one patient. The full-grown tapeworm (strobila) has been known from the earliest times, and is described by Hippocrates, Aristotle, and Pliny; but its organization and mode of development have only been properly understood during the last few years. The segments of which it is composed vary in size, and number from 800 to 1000, the earlier immature ones being extremely narrow, and the sexually mature joints commencing at about the 450th segment. From 10 to 35 ft. may be regarded as representing its ordinary length; its breadth at about the widest part being one-third of an inch. The head, which is seldom seen in the tapeworms exhibited in our museums, although the evacuation of the head with the rest of the worm is not very rare, is very small and globular (about the size of a pin's head), with black pigment ingrained in it. On examining it with a low magnifying power, it displays four circular sucking disks, in front of which is a conical proboscis, armed with a double crown of hooks, from 22 to 28 in each circular row. The head is succeeded by a very narrow neck, nearly half an inch in length, which is continued into the anterior or sexually immature part of the body, in which traces of segmentation first appear in the form of fine transverse lines, which are gradually replaced by visible joints. These joints or segments represent the body, and each mature segment contains both male and female organs of generation; and in addition to these structures, the entire series of joints is traversed by a set of vascular canals constituting the so-called aquiferous system, which consists of two main channels, one passing down on either side of the worm, and both being connected by transverse vessels, which occur singly at one end of every joint. It is only in the alimentary canal of man or some other animal that a tapeworm of any kind can attain to sexual maturity; and in all of these the eggs are fecundated before being discharged. The expulsion of the eggs may take place in any of

the following ways: First, the mature segments separate from each other, and passing out of the body, either with the ordinary evacuation of the bowels or independently, become decomposed, and set free the enclosed eggs. The single joints thus discharged undergo violent contraction after being expelled, which led to their being formerly mistaken for a distinct species of worm, to which the title *vermes cucurbitini* was applied, from their resemblance to a pumpkin seed. There is a figure in Aitken's *Medicine*, 3d ed. vol. i. p. 815, showing the joints of a *tenia medioocnellata* (which will be presently described) of the natural size, in various stages of contraction; and on examining the recently discharged excrement of a constipated dog, the same phenomenon may be very frequently observed. Secondly, the eggs may be discharged through the genital pore by pressure from any cause. It is only thus that we can account for the occasional (but very rare) coexistence of a *cysticercus cellulose* (the embryo of the worm) and an adult tapeworm in the intestinal canal of the human subject—an association which constitutes one of the most serious dangers which the matured worm can inflict upon its host, and one of the strongest indications for its removal. Thirdly and lastly, the mature joints sometimes appear to undergo disintegration within the intestine, and to liberate the eggs; but the conditions under which this disintegration occurs are unknown. In reference to the ultimate fate of the embryos *in ovo*, that are liberated in the intestinal canal, Dr. Cobbold has informed the author of this article in a private communication, that, in his opinion, they do not migrate in the living host, except when by regurgitation they occasionally get into the stomach, when, after their shells have been dissolved by the gastric juice, the young organisms commence their wanderings. The mature segments are usually expelled from the human bowel at the rate of six or eight a day. Their vitality is prolonged by moisture, which favors the distribution of the liberated eggs over grass and other vegetables, or in water, which may be used as food or drink by animals. For a full description of the eggs we must refer to Dr. Cobbold's work. It is sufficient here to remark that, in their mature condition, they "present a globular figure, and are easily recognized by their remarkably thick shell, which surrounds the six-hooked embryo. They present an average diameter of $\frac{1}{16}$ of an inch, the shell itself measuring about $\frac{1}{100}$ of an inch in thickness. After a while, by accident as it were, a pig coming in the way of these embryos, or of the proglottides, is liable to swallow them along with matters taken in as food. The embryos, immediately on their being transferred to the digestive canal of the pig, escape from the egg-shells, and bore their way through the living tissues of the animal, and having lodged themselves in the fatty part of the flesh, they there rest to await their further transformations or destiny. The animal thus infected becomes measled, its flesh constituting the so-called measly pork. In this situation the embryos drop their hooks, and become transformed into the *cysticercus cellulose*. A portion of this measled meat being eaten by ourselves, either in a raw or imperfectly cooked condition, transfers the *cysticercus* to our own alimentary canal, in which locality the *cysticercus* attaches itself to the wall of the human intestine, and having secured a good anchorage, begins to grow at the lower or caudal extremity, producing numerous joints or buds to form the strobila or tapeworm colony."—Cobbold, *Entozoa*, p. 221. In its fully mature stage the *measle* presents the appearance of an elliptical hydatid, varying in size from that of a pea to that of a small kidney-bean, the average diameter being one-third of an inch. On dissecting or breaking up a measle it will be seen that the great vesicular portion constitutes the bladder-like caudal extremity of the *cysticercus*, while the head, neck, and body can be drawn out so as to exhibit a vermiform character.

In the article GENERATIONS, ALTERNATION OF, it was stated that the group of phenomena included in that term would be further illustrated in the history of the tapeworm. From what has been already shown it appears that "we have a simple alternation of generation in which the immediate product of the proglottis (or sexually matured zooid individual) is a six-hooked brood; by metamorphosis the latter becomes transformed into the *cysticercus*, having a head with four suckers, and a double crown of hooks; and by gemmation the latter gives rise to a whole colony (strobila) of individuals, the greater part of which are destined to become sexually mature—zooid individuals or proglottides. It will be observed, therefore, that the product of a single ovum is, in the first instance, a single non-sexual embryo; in the second phase, it becomes a non-sexual *cysticercus* (these two phases together constituting the protozooid); in the third change it gives off, by budding, numerous gemmules, most of them destined to be sexually mature individuals (or deuterizooids), in this way resembling their original parents. The relation and nature of these developmental changes may be further simplified by placing the various life phases in a tabulated form as follows:

- | | |
|--|---------------|
| (a.) Egg in all stages. | } Protozooid. |
| (b.) Six-hooked embryo = proscölex. | |
| (c.) Resting larvæ, or <i>cysticercus (telæ) cellulose</i> (scolex). | |
| (d.) Immature tapeworm. | |
| (e.) Strobila, or sexually mature <i>tenia solium</i> . | |
| (f.) Proglottis (cucurbitinus) = free segment = deuterizooid. | |

—Cobbold, *Entozoa*, pp. 221, 222.

How long a tapeworm can naturally exist in an intestinal canal is not known; but there is doubtless a period at which the parasite spontaneously separates from the intes-

tinal mucous membrane of its host—a period probably coinciding with the shedding and non-renewal of the cirlet of hooks. When this separation occurs, the whole length of the worm is expelled, in the same manner as if the parasite had been first killed by the administration of a vermifuge medicine. From this history of the structure and life-history of this organism, which applies with slight difference in minor points to all other tapeworms, we proceed to describe the injurious effects which the worm in its adult and larval stages produces on man, and the precautions which should be taken to prevent its entrance into the system; while the discussion of the means of expelling it when it has once found a lodgment in the intestinal canal, will be postponed to the article on VERMIFUGES.

The common tapeworm may cause disease, and even death, by its aggressions, either in the adult or in the larval stage of its existence. A mature tapeworm in the intestinal canal may give rise to a series of anomalous symptoms, including "vertigo, noises in the ears, impairment of sight, itching of the nose and anus, salivation, dyspepsia and loss of appetite, colic, pains over the epigastrium and in different parts of the abdomen, palpitation, syncope, the sensation of weight in the abdomen, pains and lassitude in the limbs, and emaciation."—Davaine *Traité des Entozoaires*, etc., p. 103. Many cases are on record in which hysterical fits, chorea, epilepsy, convulsions of various kinds, and even mania, have been induced by the irritation excited by this parasite, and have ceased at once on its removal. But distressing as these symptomatic phenomena may be, their injurious effects are trifling as compared with the troubles which follow the deposition and growth of the larval form within the body, especially when the cysticerci find a home in the more important vital organs. There are at least a hundred cases on record in which the cysticercus has caused death by its development within the human brain. In the present state of our knowledge, it is impossible to diagnose these cases; and even if a correct diagnosis were possible, nothing could be done in the way of treatment. Epilepsy, with or without mania or imbecility, is commonly, but not invariably present in these cases. "Cysticerci," says Dr. Cobbold, "may develop themselves in almost any situation in the human body, but they occur most frequently in the subcutaneous areolar, and inter-muscular connective tissues; next, most commonly in the brain and eye, and lastly, in the substance of the heart and other viscera of the trunk."—*Entozoa*, p. 226. The adult form of the worm enters the system as the cysticercus of measy pork, and to eat raw or underdone measy pork is an almost certain means of introducing this parasite into the body. It is satisfactory to know that the temperature of boiling water is quite sufficient to destroy the vitality of the meases; and that in ordinary salted pork, and in hams, they are destroyed by the action of the salt in the one case, and of the combined salt and smoke in the other. Sausages, into which it is to be feared measy pork too often find its way, are rendered safe if they are cooked till no pink, raw-like, fleshy look can be seen in their center. Butchers are especially liable to tapeworm, in consequence of their touching and cutting measy pork, and then accidentally transferring the cysticercus by the hand, or even by the knife to the mouth, and by indiscriminately using the same knife for various meats, both butchers and cooks may readily disseminate the infection over various articles of food. The larval worm may gain access into the human body by our swallowing the mature eggs of the tapeworm. Those who, as students of this department of natural history, handle fresh tapeworms, are perhaps especially liable to this misfortune; but, says Dr. Cobbold, "our neighbors, who devour choice salads, also run a certain amount of risk, not only as regards this entozoon, but as respects several others. The vegetables may be manured with night-soil containing myriads of tapeworm eggs, or they may be watered with fluid filth into which these eggs have been cast. In such cases, one or more tapeworm ova may be transferred to our digestive organs, unless the vegetables are carefully cleansed before they appear on the table. In the same way, one perceives how fallen fruits, all sorts of edible plants, as well as pond, canal, or even river water, procured from the neighborhood of human habitations, are liable to harbor the embryos capable of gaining an entrance to our bodies. It thus becomes evident also how one individual suffering from tapeworm may infect a whole neighborhood, rendering the swine measy, these animals in their turn spreading the disease far and wide." Such a person may also prove dangerous—even fatal to his neighbors directly (without the intervention of a pig), by ejecting mature proglottides, from which thousands of eggs may escape, some of which may readily come in contact with human food or drink, make their way into the stomach, and from thence get into the circulation, and finally to the brain, where they cause convulsions and death. The most remarkable case on record of what may be termed a *measy* man, is one described, in 1864, by Delore, in the *Gazette Méd. de Paris*, and quoted by Dr. Cobbold. He died at the age of 77, from pulmonary catarrh, old age, and fractured neck of the thigh-bone; and on examining his body after death, no less than 2,000 cysticerci were found, of which 111 occurred in the nervous centers.

The tapeworm that ranks next in importance to the *tenia solium* is the *tenia medianellata*, which was first established as a distinct species by Küchenmeister only a few years ago. It exceeds the *T. solium* both as regards length, breadth, and the thickness of the individual segments: the head is also somewhat larger, abruptly truncated at the crown, destitute of a proboscis and a hook-apparatus—hence this species has been described as the *hookless tapeworm*—but furnished with very large sucking-disks, sur-

rounded by much dark pigment, which gives the head a blackish appearance. The specific name of *mediocanellata* has reference to an interesting and almost specific character in connection with the water-vascular system, into which we have not space to enter. Leuckart has proved by experiment that the measles or cysticerci which produced this worm are to be found in the muscles and internal organs of cattle. He administered proglottides of *T. medicanellata* to three calves, a sheep, and a pig. In the two last-named animals they produced no effect, as was shown by their post-mortem examination; while in the calves they produced a kind of leprosy, which has since been characterized as "acute cestoid tuberculosis," and which proved fatal if too large a dose of eggs was administered. On examining one of these animals after its restoration to health—48 days after the eggs were swallowed—he found numerous cysticerco-vesicles, larger and more opalescent than those of the pig, lodged in the muscles; and as the heads of the contained cysticerci exhibited the distinctive peculiarities presented by the head of the adult worm, "we are supplied with the most unequivocal evidence that man becomes infested with this second form of tapeworm by eating imperfectly cooked veal and beef." Hitherto the two above-described species have commonly been included under *T. solium*, from want of due examination, especially of the head. Dr. Cobbold believes that their respective frequency will ultimately be found pretty well on a par, though probably the *T. solium* will maintain a slight ascendancy, in consequence of the relative cheapness of pork. "Admitting occasional exceptions," he observes, "the hooked worm infests the poor, and the hookless worm the rich. This circumstance accords with the fact, that the lower classes subsist chiefly upon pork, while the wealthier prefer mutton, veal, and roast beef."—*Entozoa*, p. 243. It gives rise to the same symptoms as the *T. solium*.

The next five tapeworms infesting man may be passed over without notice, as being of very rare occurrence. *Tenia acanthotrius* is only known from a single case, in which, in the larval stage, it was found in the muscles of a woman. The last species we shall describe, the *T. echinococcus*, is, in its larval condition, probably more fatally injurious to the human race than all the other species of entozoa put together. In its mature (strobila) condition, in which it is found only in the dog and wolf, it seldom exceeds the fourth of an inch in length, and develops only four segments, including that of the head. The final segment, when sexually mature, equals in length the three anterior ones, and contains as many as 5,000 eggs. The proscœlex or embryo forms large proliferous vesicles, in which the scolices or larvæ (known also as acephalocysts, echinocœci, echinococcus heads or vesicles, pillbox hydatids, etc.) are developed by gemination internally. The eggs develop in their interior a six-hooked embryo, and these embryos are introduced into our bodies with food or water into which the eggs have been carried. "With an especial liking for the liver," says Dr. Cobbold, "they bore their way into this organ, or are carried along the circulating current to other organs. In these situations they sooner or later become transformed into simple vesicular, bladder-like bodies, commonly called acephalocysts or hydatids." Instead, however, of displaying the head, neck, and body of a cysticerco, the vesicle retains a globular figure. Its growth is slow, and many months elapse before echinocœci are developed within our bodies, after we have swallowed the proper tapeworm eggs and their contained embryos. There have been great differences of opinion among physiologists as to the mode of development of these echinocœci; but the following is probably the current view: The inner surface of the vesicle presents after a time slight papille or prominences, which, as they enlarge and become oval, are eventually scoleciform, and contain a cavity filled with a limpid fluid. This scolex-like development produces in its interior a brood of scolices or echinococcus heads, or, in other words, becomes gradually transformed into the so-called "brood-capsules" of helminthologists. It is almost impossible to explain the nature of these brood-capsules, with young echinocœci in their interior, without the aid of such diagrams and illustrations as are given by Cobbold in his chapter on *T. echinococcus*. In the fully developed state the echinocœci vary from $\frac{1}{16}$ to $\frac{1}{100}$ of an inch in diameter. The rostellum supports a double curve of hooks, those in the smaller row varying in size from $\frac{1}{1040}$ to $\frac{1}{1780}$ of an inch, while those of the larger series are from $\frac{1}{330}$ to $\frac{1}{1780}$ of an inch. Below the hooks are four suckers, and the general appearance of the body is finely granulated, from its containing calcareous particles. It often happens that the discovery under the microscope of a few of these little hooks at once decides the nature of an otherwise mysterious tumor. Of 373 cases of the parasite occurring in man, collected by Davaine (who devotes more than one-third of his *Traité des Entozoaires* to this subject, 165 affected the liver, 40 the lungs, 30 the kidneys, 20 the brain, and 17 the bones, while the remainder were spread over other parts; and of 136 cases collected by Cobbold, 51 affected the liver. No less than 35 of these 51 cases recovered. "Four of them were complete natural cases; two others being also temporarily cured in the same. All the rest were cured by surgical operations." It is impossible to state with accuracy the degree of prevalence of hydatids in this country, or the extent to which it proves fatal. In Iceland this disease is endemic to such a degree that about one-sixth of the population are affected with it. It produces a long illness, terminating with a painful death, and no means of cure have yet been discovered. Its prevalence in that island may be rationally accounted for. Firstly, every peasant has, on an average, six dogs, all of which are probably infested by the

mature tapeworm; and secondly, there being only six legally authorized medical men, the great majority of the population (over 10,000 persons, scattered over 1500 sq. m.) are in the hands of quacks, whose principal treatment consists in the administration of *fresh dog-cæcrement*! Our authority for this astounding specimen of homeopathic treatment is Leuckart, whose admirable popular essay, *On the Newest Discoveries regarding Human Intestinal Worms, and their Importance in Relation to Hygiene*, in the *Conversations Jahrbuch* (1863), is deserving of the most careful study. For an excellent abstract of the remarkable series of experiments—extending from 1851 to the present day—by which the relationship between the so-called cystic worms and the cestoid worms was established, we may refer the reader to Aitken's *Science and Practice of Medicine*, vol. i.; while for the subject of tapeworm generally, the highest authorities are the works of Küchenmeister and Siebold, translated by the Sydenham society; Davaine's *Traité des Entozoaires*; Weinland's *Essay on the Tapeworms of Man*; Lueckart's *Das Menschliche Parasiten* (not yet completed); and Cobbold's *Entozoa* (1864), a work equally remarkable for the vast amount of original research which it contains, and for the beauty and correctness of the illustrations.

Tapeworms, although rare among horses and cattle, are common in dogs and sheep, causing irritability of the bowels, and an unthrifty appearance. For dogs no remedy answers as well as powdered areca nut, of which 30 grains suffice for a dog weighing about 20 lbs. It is best given after 10 or 12 hours' fasting, in a little soup or milk, and should be followed in a few hours by a dose of castor oil. Neither areca nor any of the approved remedies used in men, prove effectual in sheep; and one of the best prescriptions for them consists of 40 drops of oil of turpentine, a dram of powdered green vitriol, and an ounce of common salt, given mixed in a little milk or gruel, or, where their bowels are confined, in linseed oil. A daily allowance of linseed cake and sound dry food should likewise be given with the grass or roots, and pieces of rock-salt left within the animal's reach.

TAPIOCA. See MANIOC and CASSAVA.

TAPIR, *Tapirus*, a genus of *pachydermata*, of the section *ordinaria*; having a bulky form, with moderately long legs; the fore-feet four-toed, the hind-feet three-toed; the skin thick, the hair short; the tail very small; the neck thick; the ears short; the eyes small; the muzzle elongated; the nose prolonged into a short, flexible proboscis, which, however, does not terminate in an organ of touch and prehension, like that of the elephant; 6 incisors, 2 canine teeth, and 14 molars in each jaw, the molars separated from the canine teeth by a wide interval. The best known species is the AMERICAN TAPIR (*T. americanus*), which is about the size of a small ass, and is common in almost all parts of South America, its range extending as far s. as the strait of Magellan, although it suddenly ceases to be found at the isthmus of Darien. Its color is a uniform deep-brown, but the young are beautifully marked with yellowish fawn-colored stripes and spots. The skin of the neck forms a thick rounded crest on the nape, with a short mane of stiff hair. The tapir inhabits deep recesses of the forest, and delights in plunging and swimming in water. It feeds chiefly on young shoots of trees, fruits, and other vegetable substances, but is ready to swallow almost anything that comes in its way. Pieces of wood, clay, and pebbles are often found in its stomach. It sometimes commits great ravages in cultivated grounds; a large herd of tapirs sallying forth from the forest by night, trampling and devouring all that they find in the fields. The tapir is a very powerful animal, and, protected by its thick hide, forces its way through the forest where almost no other quadruped can. When assailed by the jaguar it seeks to get rid of him by rushing through thick underwood, and if it can reach water is often successful by plunging in and diving. It is inoffensive, never attacking man; but when hard pressed by dogs makes a violent resistance, and inflicts severe bites. It is very easily tamed, and becomes extremely familiar; but its large size makes it a troublesome pet. Its hide is useful, and its flesh is eaten, although rather dry.—The MALAYAN TAPIR (*T. malayanus* or *indicus*) is found in Malacca, Sumatra, etc. It is larger than the American tapir, and its proboscis is rather longer in proportion. The neck has no mane. The color is glossy black, except the back, rump, and sides of the belly, which are white. The colors do not pass gradually one into another, but the line of separation is marked, giving the animal a very peculiar appearance. The habits of this species are very similar to those of the American tapir, and it is equally capable of domestication. The young are striped and spotted as in that species.—A third species is found in the mountainous parts of South America.

The remains of tapirs have been found in miocene and subsequent strata. In all about 12 species have been determined. Tapir-like animals are common in eocene beds. Ten species of *paleotherium* (q. v.) have been described. *Lophiodon*, of which 15 species have been observed, differs from *paleotherium* in the structure of the teeth of the lower jaw—and from other peculiarities in the same organs, *coryphodon* (containing three species) has been separated from both genera.

The tapir is a remarkable exception to the generalization deduced from the comparison of the later tertiary mammals with those living in the same districts at the present day, viz., that there is a close correspondence between the fauna of the two periods. The pliocene and post-pliocene bears, hyenas, tigers, elephants, etc., of Europe and Asia

are represented by living species of the same or nearly allied genera. The recent sloths, armadillos, and prehensile-tailed monkeys of South America were preceded by closely related forms in the later tertiary period; as were also the marsupials of Australia. Several species of tapirs have been found in Europe, but they have left no representatives nearer than eastern Asia and South America.

TAPPAN, ARTHUR, 1786-1865; b. Mass.; received a common school education; was clerk in a hardware store in Boston, 1800-7; removed to Montreal, Canada, but after the breaking out of the war (1812) he established himself in New York in the dry-goods importing business in 1814, where he was greatly prospered. He was one of the founders of the American tract society, and gave liberally for its first building; aided in establishing and endowing Lane theological seminary (Presbyterian), Cincinnati; founded a professorship in Auburn seminary; erected Tappan hall, Oberlin; established with his brother Lewis the *Journal of Commerce*, New York, 1838. A vigorous opponent of slavery, he established at his own expense the *Emancipator*, 1833; originated the New York city anti-slavery society; was appointed president of the American anti-slavery society formed in Philadelphia, contributing to it for some time \$1,000 per month; failed in 1842 and went into bankruptcy, giving up all his personal property. He was afterward connected with the "mercantile agency" established by his brother. He left a high reputation for integrity, earnestness, and benevolence.

TAPPAN, BENJAMIN, 1773-1857, b. Mass.; brother of Arthur and Lewis; at first a copper-plate engraver and printer. After giving considerable attention to portrait-painting he studied law, and was admitted to the bar. In 1803 he was a member of the legislature of Ohio, whither he had removed in 1799. He served in the war of 1812 as an aid-de-camp to gen. Wadsworth. He was afterward for several years presiding judge of the 5th Ohio circuit. In 1833 he became U. S. district judge for Ohio. He was U. S. senator, 1839-45. He was connected with the democratic party till 1848, when he became a free-soiler. He published in 1831 a volume of *Reports of cases in the court of common pleas*.

TAPPAN, DAVID, D.D., 1752-1803; b. Mass.; graduated at Harvard college, 1771; studied theology two years; became pastor of the third church (Congregational), Newbury, Mass.; Hollis professor of divinity in Harvard college, 1792, in which position he remained till his death. He published about 30 sermons and addresses, and after his death appeared *Sermons on Important Subjects*; *Lectures on Jewish Antiquities*.

TAPPAN, HENRY PHILIP, D.D., b. N. Y., 1806; graduated at Union college, 1825; studied theology two years at Auburn seminary; assistant pastor of the Reformed church, Schenectady, N. Y.; pastor of a Congregational church, Pittsfield, Mass., 1823-31; professor of mental and moral philosophy in the university of New York, 1832-38; taught a private school for several years in New York; chancellor of the Michigan university, 1852-63; elected corresponding member of the French imperial institution, and president of the American association for the advancement of education. He published *A step from the New World to the Old*, the results of his inquiry into the working of university education in England and Prussia; *Review of Edward's Inquiry into the Freedom of the Will*; *The Doctrine of Will Determined by an appeal to Consciousness*; *The Doctrine of the Will Applied to Moral Agency and Responsibility*; *Elements of Logic*; *Illustrations of Personages of the Nineteenth Century*; *Treatise on University Education*. His three works on the will were republished in Glasgow.

TAPPAN, LEWIS, 1788-1873; brother of Arthur and Benjamin; b. Mass.; was a merchant and cotton manufacturer in Boston; removed to New York in 1827; joined his brother Arthur in establishing the *Journal of Commerce*, of which he was sole proprietor, 1828-31. He took a decided stand against slavery, and for his abolition sentiments and efforts his house was sacked by a mob in 1834; failed in the financial disaster of 1837; established a "mercantile agency." He was active in anti-slavery and benevolent associations; was treasurer and president of the American missionary association, founded mainly through his efforts, and one of the early members of Plymouth church, Brooklyn. He published a *Life of Arthur Tappan*.

TAPPAN BAY, or TAPPAN SEA, reaches from a point about 24 m. n. of New York for a distance of 12 m., being an enlargement of the Hudson river. Its greatest width is 4 m., and it lies between Rockland and Westchester counties, N. Y.

TAPPING is an operation which is most commonly performed on the abdomen, but occasionally on the chest and head. Tapping of the abdomen gives great relief when the abdomen becomes inconveniently distended with fluid contained in the peritoneal sac, or, in the case of the female, in an ovarian cyst. A small incision is then made about 2 m. below the navel, through which the cutting surfaces of the trochar—the instrument used in this operation—are passed. By arrangements, into which we need not enter, the fluid escapes through this instrument. The wound made by the trochar in the abdomen will, in ordinary cases, heal in a few days.

Tapping of the chest is an operation which is occasionally required for the relief of empyema and other effusions in the cavity of the pleura. Tapping of the head has been occasionally found successful in hydrocephalus. Tapping of the pericardium has been

practiced in cases of pericardial dropsy, but it is an operation not to be recommended under any circumstances.

TAPTI, a river of the British presidency of Bombay, India, rises in the Saugur and Nerbuddah territories, in lat. about $21^{\circ} 46'$ n., flows w. through Scindhia's dominions and the districts of Candesh and Surat to its mouth in the gulf of Cambay, 17 m. below the town of Surat. It is 441 m. in length; but can hardly be said to be navigable, for even small vessels of from 40 to 50 tons burden cannot ascend higher than Surat.

TAR is a well-known substance, for which it is difficult to frame a definition, since it varies in composition, color, and consistence, and is derived from all three kingdoms of nature. In various parts of the world it occurs as a natural mineral product, and is known under the various names of bitumen, asphalt, petroleum, natural tar. See NAPHTHA. As an animal product, a species of tar is obtained from the destructive distillation of bones employed in preparing bone-black. The distillate, which possesses a most offensive odor, separates into a heavier layer of black animal tar—commonly known as *bone-oil*, or *Dippel's animal oil*—and a lighter layer of watery solution of sesquicarbonate of ammonia, commonly known as *bone-liquor*, and much employed in the preparation of various salts of ammonia. This animal tar is chiefly used for the lubrication of machinery. The vegetable kingdom is, however, the most important source of tar. On submitting wood to destructive distillation in closed vessels, we obtain a large number of products, which are described in the article WOOD, DISTILLATION OF; some are gaseous and some liquid, and of the latter one portion is soluble and the other insoluble in water. This insoluble portion constitutes wood-tar, and is composed of a mixture of various liquids holding solid matters in solution or in suspension. Among its most important constituents, professor Miller mentions several forms of hydrocarbon, such as toluol, C_7H_8 ; xylol, $C_{10}H_{10}$; cymol, $C_{10}H_{14}$; and eupion, besides a number of oxidized compounds, including creasote, $C_{24}H_{16}O_4$, picamar, and kapnomar, $C_{20}H_{11}O_2$; while among the solid portions are resinous matters resembling colophony, and a waxy substance named paraffin, and many other substances, such as naphthalin, cedriret, pittacal, pyrene, $C_{30}H_{12}$; chrysene, $C_{12}H_4$; and pyroxanthin. (When the formula is not given, the exact composition of the substance is not determined with certainty.) The *Stockholm tar*, which is so widely used in ship-building, and the *American tar*, which is almost equally celebrated, are chiefly prepared from the resinous wood of the pine, and especially of the root of the tree. The specific gravity of ordinary tar is about 1.040. Peat yields a tar very similar to wood-tar. Coal yields, on distillation in closed vessels, even a larger number of products of distillation than are yielded by wood. In addition to numerous gaseous products, the liquid portions contain water and various forms of hydrocarbon, which collectively form the liquid known as *coal-naphtha*; besides which there is a large quantity of a dark viscous matter known as *coal-tar*. The mixture of naphtha and tar is described in this work under the title of GAS-TAR. For an account of the beautiful *coal-tar colors* or aniline dyes, see the articles DYE-STUFFS and PHENYL. The distillation of coal-tar is conducted on an extensive scale as a separate branch of trade. From Miller's *Organic Chemistry* we extract the following remarks on the compounds present in this substance: "Of the substances contained in coal-tar, some are basic, and some acid, but the principal portion consists of neutral or indifferent bodies. The bases include ammonia, aniline, picoline, quinoline, and pyridine. Among the acids, the acetic is present in small amount; but the most important is phenic acid, the carboic acid of Runge. This chemist also mentions two other acids named *rosolic* and *brunolic* acids. The neutral substances contain several hydrocarbons, including benzol, toluol, cumol, and cymol, which are among the liquid constituents; while naphthalin, anthracene, chrysene, and pyrene are among those which are solid at ordinary temperatures." When either wood-tar or coal-tar is submitted to distillation, the solid brown or black residue left in the retort constitutes *pitch*.

Wood-tar, under the title of *Pice liquida*, is included in the pharmacopœia, in which its character is given as follows: "Thick, viscid, brownish-black, of a well-known peculiar aromatic odor. Water agitated with it acquires a pale-brown color, sharp, empyreumatic taste, and acid reaction." Tar was more used in medicine in former times than at present. Bishop Berkeley's commendatory essay on the use of tar-water in diseases of the chest and kidneys, is well known to all literary students. (See Chambers' *Book of Days*, vol. i. p. 108.) Since his time the inhalation of tar-vapor has been highly recommended in cases of phthisis; and tar capsules are still occasionally prescribed in cases of relaxed mucous membrane. In the present day, tar is, however, seldom used except as a local stimulant in chronic cutaneous diseases.

In modern commerce there are two kinds of wood-tar known—that made in the north of Europe from the wood of *Pinus sylvestris*, and the North American, which is made from *Pinus rigida*, *P. taeda*, *P. Australis*, &c. The distillation is usually performed in a very rude manner: a funnel-shaped hole is dug in a bank, about 6 or 8 ft. in diameter at the upper part, and not more than 18 in. at the lower. At the bottom of the hole is placed an iron pan, having a long spout or pipe, which is made to pass through the bank; the hole is then filled up with billets cut from the roots and branches of the pine trees, which, after being kindled at the top, are covered over completely with turf. The wood is thus charred from above downward; and the tar, mixed with various other pro-

ducts, flows off at the bottom through the spout into a receiver. A somewhat similar product is obtained in the distillation of coal for gas, and in the distillation of bones in forming animal charcoal. Formerly, the chief value of these materials was as a preservative coating for exposed wood-work, ships' sails, ropes, &c., in consequence of their very highly antiseptic properties. A better knowledge of their chemical history has, however, much increased their value. The imports of wood-tar into Great Britain exceeded five millions of gallons annually; while the supply of coal-tar produced in the gas-works, charcoal-works, and bone-works of the United Kingdom cannot be estimated at much under that quantity.

TA'RA, or **TARO**, *Colocasia macrorhiza*, a plant of the natural order *araceæ*, of the same genus with the cocco (q. v.), or eddoes, and cultivated for its roots, which are a principal article of food in the South Sea islands. The roots are 12 to 16 in. long, and as much in girth. They are washed to take away their acidity, which is such as to cause excoriation of the mouth and palate. They are cooked in the same way as bread-fruit, the rind being first scraped off. A pleasant flour is made of tara. Many varieties are cultivated. The plant has no stalk; broad, heart-shaped leaves spring from the root; and the flower is produced in a spathe. The leaves are used as spinach.

TARA FERN, *Pteris esculenta*, a species of brake (q. v.), the root (rhizome) of which was one of the principal articles of food of the New Zealanders, before the settlement of New Zealand by British colonists. This fern comes to perfection only in good soils, and there the plant is ten ft. high. Plants three years old furnish the best roots, which are about an inch in circumference. The root, being dug up, is cut in pieces about 9 in. long, and placed in stacks, carefully protected from rain, but through which a current of air blows. Fresh fern-root is not good; it is the better for being a year above ground. Before being cooked, it is steeped in water, and dried in the sun. It is then roasted. A large quantity of a very pleasant flour is obtained from it by beating on a stone, the fiber alone being thus left.

TARANNON SHALE, the upper member of the Llandovery formation of the Silurian rocks (q. v.). It consists of shales, or pale, sometimes purple, slates with very few fossils.

TARANTISM may be defined a leaping or dancing mania, originating in, or supposed to originate in, an animal poison. The name is supposed to be derived from the ground-spider, *tarantula* (q. v.), which conveyed the poison into the human body by its bite. The gesticulations, contortions, and cries somewhat resemble those observed in St. Vitus's dance, and other epidemic nervous diseases of the middle ages, with which tarantism was contemporaneous; but the affection differed from these in its origin, in the cachexia present, in the elegance of the movements of the victims, in their partiality for red colors, bright and luminous surfaces, their passion for music, and in their restoration depending upon the use of instrumental or vocal music as a remedy. Although the sufferers were subjected to extraordinary treatment, such as being buried up to the neck in earth, the success of music was so universal and invariable, that a class of tunes and songs was composed, called *tarantella*, to be employed in the cure of the tarantati. These have lingered long after the extinction of the malady, and may still be heard in the wilder districts of Italy. While it is highly probable that the physical symptoms were due to the bite of spiders, the mental disturbances and muscular *agitation* should be traced to the secondary effects of these upon the nervous system and imagination. It appeared in various parts of Italy, but was most prevalent in Apulia, where the insects abound. No age or class appears to have been exempt, for we read of a philosophic bishop who allowed himself to be bitten by a tarantula, dancing, etc., as fast and furiously as the peasantry.—Hecker, *Epidemics of Middle Ages*, p. 110; Madden, *Phantasms, or Illusions and Fanaticisms*, vol. i. p. 415; Milligen, *Curiosities of Medical Experience*, p. 88.

TARANTO (anc. *Tarentum*), a town of s. Italy, in the province of Lecce, is situated on a rocky islet, formerly an isthmus, between the Mare Piccolo (Little Sea), an extensive harbor on the e. or landward side of the town, and the Mare Grande (Great Sea), or gulf of Taranto, on the west. The natural channel between the two "seas" has been spanned by a long bridge of seven arches, rendering the Mare Piccolo quite useless as a harbor, and forcing ships to anchor in the outer roads, which are much exposed to s. and s.w. winds. The principal buildings are a cathedral dedicated to St. Cataldo, a native of Raphoe in Ireland, who was first bishop of Taranto; a fine episcopal palace; a castle and fortifications, erected by Charles V., and commanding both seas; and two hospitals. The streets are as narrow and dark as those of an oriental city. Taranto has manufactures of velvets, linens, and cottons, but little commerce. The Mare Piccolo, however, is still famous (as of yore) for its immense abundance of shell-fish, and a considerable portion of the population (which in 1872 amounted to 27,546) derives its subsistence from the oyster and mussel fisheries.

Ancient Tarentum, however, was a far more famous and splendid city than its modern representative. Founded by a body of Spartan emigrants about 708 B.C., it grew and prospered for centuries in happy obscurity. Its territory was not perhaps very fertile, but its pasturage was of the finest, and its olive groves were unsurpassed. Yet it

was not these things that ultimately made it the sovereign city of Magna Græcia; this rank it attained through the supreme excellence of its harbor (the Mare Piccolo), ample and secure beyond all the other harbors of lower Italy. Gradually it became the chief emporium of the Græco-Italian trade, and long after all the rest of the colonial cities in Magna Græcia had fallen into decay, Tarentum was "blooming alone" in undiminished prosperity. We may pass over its earlier history, noticing only the fact, that in the 4th c. b. c., it had for its *strategos*, or general (seven times), the philosopher and geometer Archytas, under whom it became the headquarters of the Pythagorean sect, and was honored with a visit from Plato, who was the guest of Archytas during his residence there. But while in the very acmé of its greatness, it provoked a quarrel with Rome (q. v.), 281 b. c., in which, though aided by the gallantry of Pyrrhus (q. v.), king of Epirus, it was utterly crushed, after a struggle of less than ten years; and though its natural advantages hindered it from sinking into such absolute insignificance as other cities of Magna Græcia, it was never after a place of great importance. Under the empire it was quite overshadowed by Brundisium on the Adriatic, but rose again during the Gothic wars, and passed into the hands of the Saracens and Greeks, from the latter of whom it was wrested by Robert Guiscard, the Norman, in 1063. Since then, it has shared the fortunes of the kingdom of Naples. Few relics of the classic Tarentum are extant, the chief being bits of an amphitheater, a circus, and traces of some of the temples.

TARANTULA, *Lycosa tarantula*, a species of spider, of a genus to which the name wolf-spider is often given, a native of the s. of Europe. It derives its name from the city of Taranto, in Italy, where it is very plentiful. It is one of the largest of European spiders, of a somewhat elongated shape, with rather long legs. It is one of those spiders which seek their prey by hunting. Its bite is much dreaded, and has been supposed to cause the disease called *tarantism* (q. v.).—Several species of spider nearly allied to the tarantula are found in different parts of the s. of Europe. One of them (*lycosa narbonensis*) frequents dry uncultivated grounds in the s. of France, and makes a little pit in the ground, near the entrance of which it sits watching for prey. The prey is carried into the pit to be devoured. The female shows great affection for her young.

TARARE, a thriving and important manufacturing t. of France, in the dep. of Rhone, stands at the foot of mount Tarare, one of the highest summits of the Beaujolais range, 21 m. n. w. of Lyons. Formerly unimportant, it is now a rich and flourishing town, the inhabitants of which are engaged in the manufacture of muslins, cloth, silk, and merino fabrics, and in embroidering and bleaching. The muslins of Tarare are famous for their fineness. See TARLATAN. Pop. '76, 13,563.

TARASCON, a t. of France, in the dep. of Bouches-du-Rhone, 13 m. s. w. of Avignon by railway. The church of St. Martha dates from the year 1187, and is so called after Martha, the sister of Lazarus, and the patron saint of the town. Woolen and silk fabrics, and brandy and vinegar, are manufactured. Pop. '76, 7,777.

TARAXACUM, or dandelion (q. v.) root, is employed to a considerable extent in medicine. The roots should be gathered in August and September, when the juice is most abundant. There is no very satisfactory analysis of this juice, but it is said to contain mannite, resin, sugar, gum, caoutchouc, and a crystallizable matter termed *taraxicéne*, on which its active properties probably depend. This medicine may be prescribed with advantage in the form of extract, decoction, or juice in chronic diseases of the liver, and in certain forms of dyspepsia and skin-disease which are accompanied by derangement of the biliary organs. In very large doses, it has a diuretic and slightly aperient action.

TARAZONA, a t. of Spain, in the province of Saragossa, 52 m. w. n. w. of the city of that name, on the Queyles, a tributary of the Ebro. It stands on a wind-blown plain, exposed to bleak winds from the Sierra de Moncayo on the s., and from the Pyrenees on the north. It is the see of a bishop; and contains a cathedral with a slender brick spire and rich interior, a bishop's palace, and a Moorish *Alcazar*. Pop. upward of 6,000, mainly engaged in agriculture.

Tarazona is the ancient *Turriso*; and here a few Roman troops routed a Celtiberian army. It became a municipium under the Romans; and under the Goths, by whom it was fostered, it became famous for its steel.

TARBAGATAI, a frontier t. of Chinese Turkestan, 170 m. e. of the eastern extremity of lake Balkash, in lat. 46° 44' n., long. 82° 28' east. It stands at the foot of the mountains of the same name, in a plain watered by the Imil, and with extensive meadows and pasture-grounds in the vicinity. The inhabitants consist of 3,000 exiled Chinese, 1000 of a Chinese garrison, and a number of Mongolian merchants. The trade with Russia is important.

TARBES, a t. in the s. of France, capital of the dep. of Hautes-Pyrénées, stands on the left bank of the Adour, 23 m. e. s. e. of Pau. It is a station on the *Chemin de fer du Midi*, and the center of communication with all parts of the Pyrenees, the lofty line of which bounds the prospect on the south. The modern cathedral is the principal and indeed the only notable building. There is here a *haras*, or government stud, for the improvement of the breed of horses. Tarbes is the seat of an active general trade. Pop. '76, 11,080

Tarbes dates from the time of the Romans, and its bishopric was founded in the year 420.

TARDIGRADA. See **SLOTH**.

TARE. *Ereum*, a genus of plants of the natural order *leguminosæ*, sub-order *papilionaceæ*, distinguished from *vicia* (see **VETCH**), to which it is nearly allied, by a capitate stigma, downy all over. It contains only a few species of weak climbing plants, natives of the temperate parts of the Eastern Hemisphere. One of these is the **LENTIL** (q.v.).—Two (*E. hirsutum* and *E. tetraspermum*), generally known by the name of **TARE**, are common in cornfields and hedges in Britain. They have very small flowers and pods; the leaves are pinnate, and the leaflets small. They afford nourishing food for cattle, but the quantity is so small that they are not worthy of cultivation, and are chiefly known as a nuisance in cornfields. A species of tare (*E. sativum*), with an upright branching habit, is cultivated in some parts of Europe for its herbage, which is used for feeding cattle. The bulk of herbage is small, but its nutritious character is thought to compensate for this. The leaves have from 8 to 14 pair of leaflets. The plant thrives well in poor sandy soils.—It is not supposed that the *tare* of the New Testament has any affinity to these plants: it is doubtful what it is, but it appears not improbable that it is the **DARNEL** (q.v.).

TARE AND TRET, certain deductions usually made from the gross weight of goods. *Tare* is the weight of the box, cask, bag, or wrapping in which the goods are contained; and the amount is obtained either by weighing the empty package itself, by taking an average of a few similar packages of equal size, or by mutually agreeing upon a certain proportion of the gross weight. The remainder, after deducting the tare, is the *net weight*. Another deduction, at the rate of 4 lbs. for every 104 lbs., or $\frac{1}{26}$ of the net weight, is then made, as an allowance for waste through dust, etc., and is called *tret*. Some other allowances of minute magnitude as draft, cloff, etc., are occasionally made after tret, but they are falling into disuse.

TARGET (root uncertain, but the word, in some form, found in all European languages), in its modern sense, is the mark for aiming at in practicing with the cannon, rifle, or bow and arrow. In its more ancient meaning, a target or targe was a shield, circular in form, cut out of ox-hide, mounted on light but strong wood, and strengthened by bosses, spikes, etc. Of modern targets, the simplest is that used for archery (q.v.). With regard to rifle targets, the spread of the volunteer movement and the numerous rifle-matches have caused ranges to be constructed over the whole country. The necessities are: a butt, artificially constructed or cut in the face of a hill, to prevent wide balls from scattering—a marker's shot-proof cell, near the targets—and a range of such length as can be procured. The sizes of targets used by the British army are as follows: for firing up to 300 yards, the target is 6 ft. high by 4 ft. broad, with a circular bull's-eye 1 foot in diameter, and a center of 3 feet. Up to 600 yards, the target is 6 ft. square; bull's-eye, 2 ft. diameter; center, 4 feet. Up to 800 yards, the target is 6 ft. by 8; bull's-eye, 3 ft. in diameter; and center, 5 feet. The marker signals the "hits" from his box, denoting a bull's-eye by a red-and-white flag, a center by a blue flag, and an outer by a white flag. If he show a red flag, it is to cease firing while he inspects the target. In scoring, the outer counts 2; center, 3; and bull's-eye, 4. A red flag should fly on the butt during the whole time of practice, to warn passers-by to keep off the range. The targets used by the National rifle association at Wimbledon are not the same as those used by the army. According to the Wimbledon regulations of 1876, the target for the distance of 200 yards had a circle of 40 in. diameter, divided into the circular bull's-eye 8 in. in diameter, a center of 16 in. diameter, an "inner" of 28 in., the rest of the 40 in. being accounted "outer." On the target for 500 and 600 yards, the circle of 70 in. falls into a bull's-eye of 22 in. diameter, center 38 in., inner 54 in., and the rest outer. The rectangular frame for 800, 900, and 1000 yards distance had a circular bull's-eye of 3 ft. in diameter, a center 4 ft. 6 in., a square inner of 6 ft., the remainder of the target counting as outer. Of the ordinary Wimbledon targets for 1879 (as in 1878), that for 200 yards distance is divided into a bull's-eye 8 in. in diameter; "inner," 1 foot; "magpie," 2 ft.; and outer, the remainder of the target 4 ft. square. At 500 and 600 yards, the bull's-eye is 2 ft. in diameter; the inner, 3 ft.; the magpie, 4 ft.; and outer, the rest of the target of 6 ft. square. At 800, 900, and 1000 yards, the bull's-eye is 3 ft. diameter; inner, 4½ ft.; magpie, 6 ft. square; and outer, the rest of the target of 12 ft. by 6 feet.

Previous to the inaugurating of the Wimbledon meeting in 1860, all targets were circular, and made of iron. From that year till 1873 inclusive, they were square iron plates; but in 1874 targets of canvas stretched on an iron frame were introduced.

TARGOWITZ. or **TARGOWICZA**, in Russia, a small t. in the government of Kiev (q.v.), on the borders of Kherson, was the scene (May, 1792) of a confederation ("plot" as the patriots had it) of the five Polish nobles (Potocki, Branecki, Bzureski, and two others of little note) who were adverse to the constitution of May 3, 1791. They were incited to this traitorous conduct toward their country by Catherine II., and after their conduct had been fully unveiled, they were declared traitors to their country, and only escaped death by precipitate flight to Russia, where they were munificently rewarded for

the treason which had given the czarina a pretext for executing the second partition of Poland (q.v.).

TARGUM (Chaldee, from *tirgem*, a word of uncertain origin, designating to translate, explain), the general term for the Aramaic versions of the Old Testament, which became necessary when, after and perhaps during the Babylonian exile, Hebrew began to die out as the popular language, and was supplanted by "Chaldee," an idiom, or rather a family of idioms, on which we have spoken under **SUEMITIC LANGUAGES**.

The origin of the Targum itself is shrouded in mystery. The first signs of it—as an already fixed institution—have been found by some in the book of Nehemiah, and according to tradition, Ezra and his coadjutors were its original founders. However this be, there can be no doubt that its beginnings belong to a comparatively early period. The Mishna (q.v.) contains a number of strict injunctions respecting it, and also respecting a certain guild of *meturgemans* (whence *dragoman*) or interpreters, who had sprung up as professional followers of those learned men who, at a previous period, had volunteered their services in the translation and paraphrastic interpretation, both activities, as we said, implied by the term. At first, and indeed for many centuries, the Targum was not committed to writing, for the same reason that the "oral law" itself was not at first intended ever to become fixed as a code for all times. In the course of time, however, both had to yield to circumstances, and their being written down was considered preferable to their being utterly forgotten, of which there was no small danger. Yet a small portion only of the immense mass of oral targums that must have been produced, has survived. All that is now extant are three distinct targums on the Pentateuch, a targum on the prophets, targums on the Hagiographa, viz., on Psalms, Job, Proverbs, the five "Megilloth" (Song of Songs, Ruth, Lamentations, Esther, Ecclesiastes), two targums on Esther, one on Chronicles, one on Daniel, and one on the apocryphal pieces of Esther. The most important of the three Pentateuch targums is the one named after Onkelos (q.v.), probably a corruption of Akylas, whose Greek version had become so popular that this Chaldee version was honored with being called after it. In its present shape, this translation dates probably from the end of the 3d or beginning of the 4th c. A.D., although snatches of it were collected and written down more than a hundred years earlier. We have spoken of its language and its general character already under **ONKELOS**, and may here briefly state that it is composed in an Aramaic closely resembling that of Daniel, and that it is as excellent a translation "for the people," which it meant to be, as can well be conceived. Occasionally, when the subject imperatively demands it, it introduces some paraphrastic by-work, and it only deviates from the text where the divine dignity would have appeared to suffer in the eyes of the multitude by a literal interpretation. Its value for exegetical purposes is no less great than it would be for linguistic and antiquarian purposes, were it more explored with that view than has been the case as yet.

The two other Targums on the Pentateuch, hitherto known as Targum Jonathan ben Uzziel, and Targum Jerushalmi, are merely recensions of one and the same version—the name of the first recension being merely a perpetuated error of a single scribe—which owes its origin to Palestine or Syria (Onkelos being of Babylonian origin), and cannot well have been redacted before the 7th c. A.D. There is no doubt that originally this "Jerusalem Targum" embraced the whole of the Old Testament, as did the Babylonian; but nothing has survived beyond these two recensions of the Pentateuch, the first complete, the second in a fragmentary condition: the former probably intended as an emendation of Onkelos, chiefly in the direction of homiletic paraphrase and legendary lore, and the latter as a further emended emendation of single portions. As a version, this Targum is of small importance; but it is invaluable as a storehouse of allegories, parables, sagas, and the like popular poetry of its time. Its language and grammar are exceedingly corrupt; it abounds, moreover, with foreign—Greek, Latin, Persian, and Arabic—terms; and its general use lies more in the direction of Jewish literature itself, as well as of archaeology and antiquities of the early Christian centuries, than in that of a direct interpretation of the Bible text itself. The Targum on the prophets is generally an erroneously ascribed to Jonathan ben Uzziel, an eminent master of the law at the time of Hillel the elder; the fact being that, except one spurious Talmudical passage, in which mention is made of his having translated the Prophets, this Targum is everywhere else, from the Talmud down to the authorities of the 10th c. A.D., ascribed to one R. Joseph, president of a Babylonian academy in the 4th century. And it would indeed seem as if this statement was completely in accordance with the real facts—if not the writing, but the collection and final redaction of this Targum is ascribed to him. Respecting the nature of this version, it may be said that, while being tolerably literal in the first—historical—books, it gradually becomes a mere frame-work of Midrash (q.v.) or Haggada, which it introduces at every turn and at great lengths. It further contains historical bits, disguised, or rather typified, and some lyrical pieces of rare poetical value. In language and general manner, it resembles Onkelos, with which it is of one growth, place, and date, and of which it forms only a kind of continuation.

To the same Joseph "the blind" to whom the redaction of the foregoing Targum is probably due, is further ascribed a Targum on the Hagiographa. But between him

and the Hagiographical Targums lie, at the least, 600 years; their date being approximately given as about 1000 A.D. Certain distinctions between the different books must further be made. The Targums on Psalms, Job, and Proverbs were probably contemporaneous compositions due to Syria. The two former are made more paraphrastic than the last, which resembles closely the Syriac version. The paraphrase on the five "Megilloth"—a very late production indeed—is principally a collection of more or less poetical fancies, traditions, and legends, to which the single verse in hand merely seems to furnish the key-note. There is, we need not add, but very little to be found in them of what originally must have formed the Targum on these books; nor is there the slightest hint to be found as to who was the real author or editor of their present form. That it was one man's work, is probable enough, from a certain unity of design and style noticeable in all of them. Their dialect lies somewhat between the e. and w. Aramaic. The Targum on the book of Chronicles—almost unknown until the 17th c.—also belongs to a late period, and was probably composed in Palestine. There are some useful philological, historical, and chiefly geographical hints to be gleaned from it, but nothing more; least of all can it be used exegetically. A Persian version of a Targum on Daniel (unedited) is all that has been discovered on that book as yet. It was probably composed in the 12th c., the influence of the early Crusades being plainly visible in it. On the paraphrase of the apocryphal pieces of Esther, we shall not dwell here, any more than on the scanty fragments of a "Palestinian Targum" that are found either interspersed in the general (Babylonian) Targum, or as independent pieces. It seems probable that more of this Palestinian version will come to light some day, as authorities of a few centuries back still quote from it rather largely. At present, however, their quotations are nearly all that remains.

Very little—we might say, next to nothing—has been done as yet to utilize this most important branch of Aramaic literature: in fact, not even an attempt at anything like a critical edition has been made, although it would be difficult to find a more corrupt text than that offered by the MSS. and single printed portions. Some parts have been done into Latin, English, German, etc. The ed. pr. of Onkelos is dated Bologna, 1482; that of the Targum on the Prophets, Leiria, 1494.

TARIFA, a sea port t. of Spain, 20 m. s.w. of Gibraltar. It is the most southern town of Europe, is surrounded by tower-embattled walls, and communicates by a causeway with a small island, on which stand a fortress and light-house. The town is the most thoroughly Moorish in Andalusia; it is quadrangular in shape, and its streets are narrow and dark. Tunny and anchovy fisheries are actively carried on. Pop. 8,300.

Tarifa, the Carthaginian *Josa*, and the Roman *Julia Traducta*, received its present name from the Moors, who are said to have called it after Tarif (=Tarik?) Ibn Malik, who landed there to reconnoiter previous to the conquest of the country. See *MIZA*; *RODERIC*. It was successfully defended in 1811 by 2,500 troops (mostly British) against a French force of 10,000 men, under Victor and Laval.

TARIFF (from *Tarifa* (q.v.), where, during the rule of the Moors in Spain, duties were collected), a table or catalogue, generally drawn up in alphabetical order, of the duties, drawbacks, bounties, etc., charged or allowed on different kinds of merchandise, as settled by authority, or agreed to between different states. The principles of the tariffs of different countries depend on their respective commercial policy, and on the fluctuating interests and wants of the community. According to the presently existing British tariff, only about 20 kinds of merchandise are subject to an import duty, and none to an export duty.

TARIFF (*ante*). In the United States the term tariff is used to designate the schedule of duties fixed by congress on imported goods. Considerations of the subject of revenue necessarily entered into the question of the formation of the government of the United States. The period of the adoption of the constitution found the country in the possession of a rich and widely extended territory, but having a sparse population, and an empty treasury. Accordingly congress entertained this subject almost at its first session; since the first meeting having taken place April 6, 1789, on the 8th Mr. Madison, in committee of the whole, introduced the matter of duties on imports; proposing that specific duties should be levied on spirituous liquors, wines, molasses, teas, sugars, pepper, cocoa, and spices; and an *ad valorem* duty on all other articles; also a tonnage duty on American vessels in which merchandise was imported, and a higher rate on foreign vessels. The subject was debated at length; and even at this early period, petitions of manufacturers and others were sent in making recommendations and asking encouragement. The first tariff act became a law under the approval of the president, July 4, 1789. It was comparatively simple, placing specific duty on some forty articles and *ad valorem* duties on all others. On Aug. 10, 1790, a second tariff act was passed, recommended by Alexander Hamilton, secretary of the treasury, which increased the duties by an average of about 2½ per cent. On Mar. 3, 1791, another act was passed, increasing the duties on distilled spirits; and in 1792 a further increase was made by the act of May 2, "for the protection of the frontiers and other purposes." Additional acts passed in 1794 and 1797 were still in the direction of increased duties, and of the application of customs duties to an extended list of articles. Such was also the case with the acts of May 13, 1800, and Mar. 26, 1804; while the acts of Mar. 3, 1807, and Mar. 4, 1808,

repealed the duties on certain articles, notably salt, and evinced a disposition toward greater freedom of trade. The war of 1812, with Great Britain, brought about the passage of the act of July 1, 1812, which imposed an addition of 100 per cent to existing duties; and a further addition of 10 per cent upon goods imported in foreign vessels. The acts of 1813 and 1815 imposed a duty on foreign salt, but repealed the discriminating duties as regarded goods imported in foreign vessels, leaving it to the discretion of the president when to apply such repeal. The tariff act of 1816 brought Henry Clay forward as an advocate of "a thorough and decided protection to home manufactures by ample duties." In the discussions on this bill the theory that protection and not revenue was the prominent object of tariff legislation, was first emphatically advanced. This act, which was essentially protective, became a law on April 27, 1816. In 1824, the principle of "favored nations" first entered into legislation on this question, certain discriminating duties being by law suspended in the case of the Netherlands and Prussia, and the Hanseatic cities of Hamburg, Lubeck, and Bremen. In the same year a new bill was framed and offered, and in the discussion which followed James Buchanan was prominent on the side of protection, and Daniel Webster on that of freer trade, the latter saying that with him "it was a fundamental axiom that the great interests of the country were united and inseparable; that agriculture, commerce, and manufactures must flourish together, or languish together, and that all legislation was dangerous which proposed to benefit one of them, without looking to the consequences that might fall upon the others." This bill, which was less pronounced in the interests of protection than others which had preceded it, passed the house on April 16, 1824, by a vote of 107 yeas to 102 nays. It was materially modified in the senate in favor of greater liberality, and, thus amended, became a law on May 22. The general tendency of tariff legislation continued in the direction of a reduction of duties, as was shown by the acts of 1828, 1830, and 1832; and in 1833, Mr. Clay found it necessary to bring forward his "compromise bill," which was designed to reconcile the opposing factions, and which was passed. By this time the tariff question had become a political one, and whigs and democrats were arrayed on the respective sides of protection, and a tariff for revenue only; to be followed after 1850 by the republicans and democrats, differing after the same fashion. The general tendency has been in favor of the extreme limits of protection; as the United States has grown to become more and more a manufacturing country; and has constantly entered into fresh competition with other manufacturing countries. Under this system have been built up the iron, silk, and other great industries. Meanwhile, it has been urged by free-traders that the conduct of tariff legislation under this system has served to sustain prices at a burdensome figure, and that while large manufacturing industries have been fostered and have prospered, this has been at the expense of the consumer, and to the general injury of the masses of the population. Other objections to a high protective tariff have been that it encourages smuggling and adulteration, opens a way for corruption in legislation and collection of customs; and has organized a vast body of office-holders. Efforts have been made during recent sessions of congress to modify the tariff in the direction of free trade, but have proved fruitless of important results, and unpopular with the majority of the people.

TARIM RIVER. See TURKISTAN, EASTERN.

TARLATAN, a thin gauze-like fabric of cotton, used for ladies' ball-dresses, etc. It is usually dyed or printed in colors. Tarare, in France, is the chief center of this manufacture, whence it is largely exported. Switzerland alone competes with France in the production of tarlatan, but those of the latter country far surpass the former in fineness.

TARLETON, Sir BANNASTRE, 1754-1833; b. England; a lieutenant-col. in the army of Cornwallis during the revolutionary war. At the head of a loyalist force known as "the British legion," he inflicted considerable damage upon the Americans in the south. He massacred col. Buford's regiment at Waxhaw creek, 1780, but was defeated the next year, near Cowpens, by gen. Morgan, with a smaller force. He was with Cornwallis till the end of the war. He was elected to parliament in 1790, and made major-gen. in 1817. He wrote a *History of the Campaigns of 1780 and 1781 in the Southern Provinces of North America*.

TARN, a department in the s. of France, bounded on the n. by the departments of Aveyron and Tarn-et-Garonne, receives its name from the river Tarn. Area, 2,216 sq. m.; pop. 76,359,232. The surface is in general elevated, and in the s. and s.e. are the montagnes Noires and the monts de l'Espinois, branches of the Cévennes. The rock of Montalet, the principal summit, is 4,430 ft. high. Wooded mountains, vine-clad hills, beautiful valleys, and fertile or grass-producing tracts, are the principal features of the landscape. The chief river is the Tarn, an affluent of the Garonne (q.v.), and which has a westward course of 200 miles. A fifth part of the surface is covered with forests, chiefly of oak and beech. The department is for the most part agricultural, and the most improved methods are in use. Eleven million gallons of wine are made in average years. Tarn is divided into four arrondissements: Albi, Castres, Gaillac, and Lavaur. Albi is the capital.

TARN-ET-GARONNE, a small department in the s. of France, bounded on the s.e. by the department of Tarn. Area, 1435 sq.m.; pop. '76, 221,364. The principal river is the Garonne, which flows n.w., and its affluents, the Tarn and Aveyron. The surface is marked by plateaux, about 1000 ft. in average altitude; the highest hills do not rise above 1600 feet. The climate is beautiful, healthy, and temperate. Cereals are raised in great quantities. Of wine, 11,000,000 gallons are produced. The department is divided into the three arrondissements of Montauban, Castelsarrasin, and Moissac. Montauban is the capital.

TARNOPOL, a t. of Austria, in Galicia, charmingly situated on the left bank of the Sered, 80 m. e.s.e. of Lemberg. Agriculture employs the great mass of the inhabitants, and the horse market held here periodically is the most important in Galicia. Horse-races also take place. Pop. 20,000.

TARNOW, a t. of Austrian Galicia, near the right bank of the Dunajec, a navigable tributary of the Vistula, and 49 m. e. of Cracow by the Vienna and Lemberg railway. It is the seat of a Catholic bishop, contains a theological college, and a beautiful cathedral, in which are numerous monuments of marble, surmounted by statues, enriched with *bassi rilievi*, and rising to from 60 to 70 ft. in height. Several industries are actively carried on, and there is a good general trade. Pop. (including suburbs) 21,800.

TARPAULIN, a large sheet of the coarsest kind of linen or hempen cloth, saturated with tar to render it waterproof. It is used for covering loaded wagons, the hatchways of ships, and similar things, as a temporary protection from wet.

TARPEIAN ROCK (Lat. *Rupes Tarpeia*, or *Mons Tarpeius*), the name originally applied to the whole of the Capitoline hill (see **CAPITOL**), but latterly confined to a portion of the southern part of the hill, the following being the legend commonly related in connection with it. In the time of Romulus, Tarpeia (a vestal virgin), the daughter of Sp. Tarpeius, governor of the Roman citadel on the Capitoline, covetous of the golden ornaments on the Sabine soldiery, and tempted by their offer to give her what they wore on their left arms, opened a gate of the fortress to the Sabine king, Titus Tatius, who had come to revenge the rape of the Sabine women. "Keeping their promise to the ear," the Sabines crushed Tarpeia to death beneath their shields, and she was buried in the part of the hill which bears her name. Subsequently it was not unusual for persons condemned on the charge of aspiring to restore the monarchy, or of treason to the state generally, to be hurled from the Tarpeian rock—e.g., the famous Manlius, the savior of the capitol during the invasion of the Gauls.

TARQUINIUS, the family name of two kings of Rome, with whose history, or rather with the legends regarding whom, the fortunes of the city are closely interwoven. The story goes that Demaratus, a Corinthian noble, emigrated from Greece, and settled at Tarquinii, in Etruria, where he married an Etruscan wife, by whom he had two sons, Aruns and Lucumo. Aruns died during his father's lifetime, but Lucumo married into one of the noblest Etruscan families. His wife, named Tanaquil, was a bold, ambitious and wise woman. By her advice, Lucumo resolved to go to Rome. He set out, accompanied by a large train of followers, and as he approached the Janiculum, an eagle swooped down, and snatching off his cap, carried it up to a great height, then descending, placed it on his head again. Tanaquil, who was deeply skilled in the science of augury, prophesied from this omen the highest honors for her husband, who was hospitably received at Rome, and soon after admitted to the rights of citizenship, whereupon he took the name of L. Tarquinius, or, according to Livy, L. Tarquinius Priscus. The Roman monarch, Ancus Marcius, appointed him guardian of his children; and on the death of the former, the senate and the citizens unanimously elected him to the vacant throne. His reign was a glorious one. Against the Latins, Sabines, and (according to Dionysius) the Etruscans, he waged successful war, forcing the whole of the twelve sovereign cities of Etruria to recognize his supremacy, and do him homage. But the works that he executed at home are even more renowned than his exploits abroad. To L. Tarquinius Priscus (*Priscus* is commonly translated the "elder;" but Niebuhr objects to this translation as involving an anachronism, and notices the fact that *Priscus* is a common cognomen among the Romans) are ascribed the construction of the magnificent *Cloaca*, or sewers (see, however, **CLOACA MAXIMA**), which remain uninjured to this day; the laying out of the circus Maximus and the Forum; the institution of the great or Roman games; and (some say) the building of the Capitoline temple (see **CAPITOL**). The legend also represents him as effecting certain political and sacerdotal changes. See **ROME**. Tarquinius was assassinated after a reign of 38 years, at the instigation of the sons of Ancus Marcius, who considered themselves as best entitled to the throne, and dreaded lest he should use his influence to get his favorite and son-in-law, Servius Tullius, chosen as his successor. But their crime did not avail them, for, through the dexterity of Tanaquil, Servius was elected to the vacant throne, and signalized himself not only by his military exploits, but also by great organic changes in the Roman constitution (see article **ROME** for an account of the "Servian reform"). Tarquinius left two sons, L. Tarquinius Superbus and Aruns, both of whom married daughters of Servius Tullius; and two daughters, one of whom married Servius Tullius himself and the other M. Brutus, by whom she became mother of L. Brutus, first consul of the Roman republic.

L. TARQUINIUS SUPERBUS, son of the preceding, having murdered his father-in-law, Servius Tullius, at the instigation of his wife, is represented in the legend as audaciously usurping the vacant throne; but as the whole drift of his legislative policy was to abolish the reforms of Servius, there can be little doubt that the real significance of this part of his career lies in the fact that it indicates a successful reaction, on the side of the patricians, against the more liberal and progressive policy of the preceding age. That the younger Tarquinius, at least, is a historical character, seems to be pretty generally allowed. The incidents of his career are so numerous and coherent, and the impress of his name and character is so deeply stamped on the national memory, that he cannot be regarded as a wholly imaginary personage. Analyze the story how we may, there will always remain a residuum of insoluble fact, not essentially at variance with the character of the tragic tradition. As far as we can gather from the ancient annals, the usurpation of Tarquinius was probably achieved by the help of an enterprising section of the nobles, who clung tenaciously to their privileges, and could not endure the constitutional recognition of the *plebs*. It does not appear that the whole of the senators connived at or even approved of Tarquinius's procedure. We are expressly told that he drove numbers of those whom he mistrusted into exile: in other words, he persecuted and banished the adherents of the Servian policy of conciliation. Like a Turkish tyrant, he surrounded himself with a body-guard—another indication of the original insecurity of his position, and strengthened himself by foreign alliance, marrying his daughter to Octavius Mamilius, prince of Tusculum. By means of subtle and unscrupulous intrigues he obtained or consolidated the Roman hegemony in Latium; offered sacrifice in the name of all the Latins at the Alban mount; fused the contingents of the latter with the Roman legion; put to death as traitors such of their chiefs as opposed him (e.g., Turnus Herdonius); and, at the head of the combined forces, penetrated into the Volscian marshes, and, subdued the natives. On his return he completed the building of the capitol, which the elder Tarquinius had begun, and deposited in the vaults the Sibylline books he had curiously acquired. See **SIBYL**. He next conquered the town of Gabii (where many of the banished nobles had found shelter), through an elaborate stratagem, in which his son Sextus played the principal part. But his lavish expenditure both in war and peace necessitated the imposition of heavy taxes, and murmurs of discontent were heard among the people. The patience both of plebs and patricians was beginning to give way. Coincident with this state of things a fearful omen was beheld: from the altar in the royal palace crept forth a serpent, and devoured the entrails of the victim. Tarquinius sent two of his sons, Titus and Aruns, to Delphi to consult the oracle. They were accompanied by their cousin, L. Junius Brutus (q.v.), who had long feigned himself a fool in order to save his life, for Tarquinius had killed his father and brother in order to possess himself of their great wealth. On their return they found that the king had opened war upon the Rutuli, and was besieging Ardea, whereupon they joined the Roman camp. Here occurred, between Sextus and Collatinus, the famous dispute about the virtues of their respective wives, which led to the rape of Lucretia. The details of this legend are so familiar that it is unnecessary to recount them. Suffice it to say that it roused such a storm of indignation that the people of Collatia (where the shameful deed was done) rose in arms, and renounced their allegiance to Tarquinius. Brutus carried the news to Rome, and the senate, fired with a righteous anger, deposed the tyrant; finally, the army before Ardea also revolted. Tarquinius and his sons were obliged to flee, and an aristocratic republic was constituted at Rome. Three different attempts were made to restore Tarquinius by force: first, by his own Etruscan kinsmen of Tarquinii; second, by Lars Porcena (q.v.) of Clusium; and third, by his son-in-law, Octavius Mamilius, "prince of the Latian name," all of which, according to the legend, failed; and at length Tarquinius, utterly baffled and beaten, retired to Cumæ, where he died, a wretched and childless old man, for all his sons had met death before him.

TARRAGON. See **ARTEMISIA**.

TARRAGONA, a province in n.e. Spain, part of the ancient division of Catalonia or Cataluna, lying on the Mediterranean and adjoining the provinces of Teruel, Saragossa, Barcelona, Castellon, and Lérida, drained by the Ebro and a few streams of little importance; 2,451 sq. m.: pop. '70, 350,395. There is much mountainous surface, the Prades range crossing the province from n. to s.; but the valleys and lower slopes are very rich in soil and covered with vineyards, from which excellent wine is produced; other exports are brandy, cork, silk, velvet, and woolen and cotton goods. Capital, Tarragona.

TARRAGONA, a sea-port of Spain, chief city of the modern province of the same name, stands on the Mediterranean shore, at the mouth of the Francoli, 60 m. w. of Barcelona. It consists of two portions—the upper (the ancient) and the lower (the modern) towns. The former stands on a hill 720 ft. high, and is girdled with ramparts. The lower town, completely separated from the higher by a line of works, is regular and open, and is defended by two forts. The beautiful cathedral, in Gothic and Norman, and which dates from the middle of the 12th c., is the principal edifice. There is an interesting antiquarian museum, rearranged in 1868. Brandy distilling and the manufacture of wines and olive oil are the chief industries. The harbor is safe for the vessels that visit Tarragona. Pop. 19,500.

Tarragona, called by the Romans *Turraeo*, was founded by the Phenicians (who called it *Tarchon*, citadel), and afterward became the capital of the Roman province of *Tarracoenensis*. Among the Roman antiquities are the remains of an amphitheater, which has been used as a quarry; a magnificent aqueduct, 96 ft. high and 700 ft. long—still in use—and near the town the tower of the Scipios, much decayed. Tarragona was taken and cruelly sacked, in June, 1813, by the French under Suchet.

TARRANT, a co. in n.w. Texas; 900 sq.m.; pop. '80, 24,678—23,792 of American birth; 2,187 colored. Co. seat, Fort Worth.

TARRYTOWN, a village of N. Y., on the e. bank of the Hudson river, 27 m. n. of New York city. It is beautifully situated on a lake-like expansion of the river, called the Tappansee; surrounded with fine scenery, and filled with elegant residences. It has 6 churches and 4 academies, and is noted as the scene of the capture of Major André. Pop. 3,500.

TARSHISH, probably the same as *Tartessus*, a city and emporium of the Phenicians in Spain, somewhere near the mouth of the Guadalquivir. It is frequently mentioned in Scripture, notably so in connection with the prophet Jonah, who took ship for Tarshish, when he sought to "flee from the presence of the Lord."

TARZIA-WORK, a beautiful kind of marquetry made in Italy. It is produced by inlaying pieces of colored wood so as to represent figures and landscapes. That of Sorrento is very celebrated; and lately, many fine pieces of this work have been made in Perugia. It is usually applied to the decoration of cabinet-work.

TARSUS, anciently the chief city of Cilicia, and one of the most important in all Asia Minor, situated on both sides of the navigable river Cydnus, in the midst of a beautiful and productive plain, and about 18 m. from the sea. It was a great emporium for the traffic carried on between Syria, Egypt, and the central region of Asia Minor. In the time of the Romans, two great roads led from Tarsus, one n. across the Taurus by the "Cilician Gates," and the other e. to Antioch by the "Amnianian" and "Syrian Gates." Tarsus, judging from its name, was probably of Assyrian origin; but the first historical mention of it occurs in the *Anabasis* of Xenophon, where it figures as a wealthy and populous city, ruled by a prince tributary to Persia. In the time of Alexander the Great, it was governed by a Persian satrap; it next passed under the dominion of the Seleucidæ, and finally became the capital of the Roman province of Cilicia. At Tarsus, Anthony received Cleopatra, when she sailed up the Cydnus, with magnificent luxury, disguised as Aphrodite. Under the early Roman emperors, Tarsus was as renowned for its culture as for its commerce, Strabo placing it, in respect to its zeal for learning, above even Athens and Alexandria. It was the birthplace of the apostle Paul, who received the greater part of his education here; and here the emperor Julian was buried. Gradually, during the confusions that accompanied the decline of the Roman and Byzantine power, it fell into comparative decay; but even yet, it is—under the name of *Tarso* or *Tarsus*—the most considerable place in the s.e. of Asia Minor, has a pop. of 30,000 (in winter); and exports corn, cotton, wool, copper, gall-nuts, wax, goats, hair, skins, hides, etc.

TARTAN, or **PLAID**, a pattern woven in cloth, in which bands of different colors are woven or printed side by side, both the warp and weft way of the material, thus giving the well-known checkered pattern. This is probably the oldest pattern ever woven; at all events, the so-called shepherd's plaid of Scotland is known to have a very remote antiquity among the eastern nations of the world. The plaid pattern admits of a very great variety of modifications, by the introduction of different colors, and by varying the amount of each color employed. These colored plaids were in great favor in the Highlands of Scotland, where each clan wore a particular kind as its distinctive dress.

TARTAR, a mixture of bitartrate of potash and tartrate of lime (see **TARTARIC ACID**), is a deposit formed from wine, and known in its crude form as argol (q.v.). About 900 tons annually of this substance are imported into Great Britain, from the chief wine-producing countries of Europe and the Cape Good Hope.

The word *Tartar*, which gives the name to tartaric acid, is derived from the Greek *Tartaros*, hell. "It is called *Tartar*," says Paracelsus, "because it produces oil, water, tincture, and salt, which burns the patient as Tartarus does."

TARTAR, CREAM OF. See **TARTARIC ACID**.

TARTAR, FOLIATED EARTH OF, an old name for acetate of potash, in consequence of the foliated satiny masses in which that salt occurs.

TARTAR, SOLUBLE, a term applied by some chemists to neutral tartrate of potash, and by others to borotartaric acid. See **TARTARIC ACID**.

TARTAR OF THE TEETH is a deposit of salts of lime and organic matter from the saliva, and usually occurs most abundantly on the inferior incisors. If it is suffered to accumulate, it causes inflammation and absorption of the gum, and gradual loosening of the teeth. The accumulating of this substance may usually be prevented if due attention is paid to the cleaning of the teeth. "The teeth," says Dr. Druitt, "should be cleaned at least twice a day with a soft tooth-powder (precipitated chalk is best) and a little soap. The hairs of the tooth-brush should be soft, and not too closely set, so that

they may penetrate the better into the interstices of the teeth." When the tartar has accumulated to any extent, it must be removed by the *scaling instruments* of the dentist.

TARTARIC ACID. Ordinary tartaric acid, $C_4H_4O_6 \cdot 2H_2O$, is usually seen in the form of colorless, transparent, oblique, rhombic prisms, which are not affected by the action of the air, have an agreeable acid taste, and are soluble in water and alcohol. The crystals when gently warmed become strongly electric, the opposite sides of the crystals exhibiting the opposite forms of electricity. On heating tartaric acid to about 340° , it fuses; and at a slightly higher temperature it becomes successively changed, without losing weight, into two malameric acids, *metatartaric* and *isotartaric* acids, the former of which is bibasic and the latter monobasic. At about 374° , two atoms of the acid lose one equivalent of water, and *tartralic acid*, $C_{16}H_8O_{20} \cdot 3H_2O$, is formed. If the same temperature be maintained a little longer, half the basic water is expelled, and *tartralic acid*, $C_{16}H_8O_{20} \cdot 2H_2O$, is formed; and finally, all the basic water is driven off, and *anhydrous tartaric acid*, or *tartaric anhydride*, $C_4H_2O_6$ (or $C_{16}H_8O_{20}$), remains in the form of a white porous mass insoluble in water, alcohol, or ether. If, however, it be allowed to remain long moist, it gradually becomes converted into crystallized tartaric acid. Finally, on distilling tartaric acid in a retort at a temperature of 400° and upward, it is decomposed into certain gases and empyreumatic oily matters, water, and acetic, pyruvic (or pyroracemic) and pyrotartaric acids.

Oxidizing agents, such as peroxide of lead or nitric acid, readily act upon tartaric acid, and convert it into formic and carbonic acids; and when fused with caustic potash, it splits up into acetic and oxalic acids. It is one of the strongest of the organic acids.

This acid occurs abundantly in the vegetable kingdom both in the free and combined state. It is found as a free acid in tamarinds, grapes, the pine-apple etc.; and in combination with potash and lime in tamarinds, grapes, mulberries, and the unripe berries of mountain-ash, and in small quantity in the juice of many other vegetables. It is, however, from argol (q.v.), a product of the fermentation of grape-juice, that the tartaric acid of commerce is obtained. The details of the process may be briefly described as follows: argol, or crude bitartrate of potash, is dissolved in boiling water, and chalk is added as long as effervescence occurs. An insoluble tartrate of lime is precipitated, and tartrate of potash remains in solution. This tartrate of potash is converted by the addition of chloride of calcium, into insoluble tartrate of lime and soluble chloride of potassium. The tartrate of lime obtained by these two operations, if treated with sulphuric acid, readily yields free tartaric acid in solution, with sulphate of lime as a precipitate. The filtered liquid, when cooled and evaporated, yields tartaric acid in crystals.

Tartaric acid is used in large quantity by calico-printers and dyers for the removal of certain mordants, and is much employed in medicine in the preparation of effervescing draughts and for other purposes.

Tartaric acid being bibasic, can form both acid and normal (or neutral) salts, according to the two general formulæ, MO, HO, \bar{T} , and $2MO, \bar{T}$, when M signifies any metal, and \bar{T} is used as a symbol for anhydrous tartaric acid, $C_4H_2O_6$. The normal salts may contain (1) two similar or (2) different protoxides, or (3) a protoxide and sesquioxide, or (4) a protoxide and a teroxide; as, for example—(1) Tartrate of potash, $2KO, \bar{T}$; (2) Tartrate of potash and soda, or Rochelle salt, KO, Na, \bar{T} ; (3) Tartrate of potash and iron, KO, Fe_2O_3, \bar{T} ; (4) Tartrate of potash and antimony, or tartar emetic, $KO, SbO_3, \bar{T} + Aq$. The tartrates are for the most part formed by partially or entirely saturating the free acid with an oxide or carbonate, or in the case of neutral tartrates containing two oxides, by saturating a solution of the bitartrate of one oxide with the other oxide. The most important tartrates are the following:

Tartrate of potash, $2KO, \bar{T}$, a soluble salt, which crystallizes with difficulty, and is formed in preparing tartaric acid from *bitartrate of potash*, KO, HO, \bar{T} . This salt is prepared from argol by extraction with boiling water, which dissolves about one-sixth of its weight. As it is much more insoluble in cold water, of which it requires 240 parts, it crystallizes readily as the hot solution cools. The snowy white rhombic prisms which are thus deposited constitute *cream of tartar*. When heated to redness in a covered crucible, a charred mass, consisting of carbonate of potash and charcoal in a fine powder, remains, and is used in the laboratory for reducing operations under the title of *black flux*; and if cream of tartar is deflagrated with twice its weight of niter, *white flux*, also a reducing agent, consisting solely of carbonate of potash, is obtained. *Tartrate of potash and soda* has been already described in the article ROCHELLE SALT. *Tartrate of potash and iron*, or *ferrum tartaratum*, $KO, Fe_2O_3, \bar{T} + Aq$, and *tartrate of ammonia and iron*, or *ammonio-tartrate of iron*, $H_4NO, Fe_2O_3, \bar{T} + 4Aq$, although the latter is not included in the pharmacopœia, are excellent medicinal preparations of iron. For the method of preparing them, the reader is referred to *Neligan's Medicines*, 6th ed. p. 658, etc. They occur in the form of brilliant, semi-transparent, reddish-brown scales, and are soluble in about their own weight of water at 60° . *Tartrate of potash and boron*, known also as *soluble tartar* (although the term has also been applied to tartrate of potash),

or soluble cream of tartar, $\text{KO}, \text{BO}_3, \bar{\text{T}}$, has been employed medicinally, but is not now used. *Tartrate of antimony and potash*, known also as *tartarized antimony* and *tartar emetic*, $\text{KO}, \text{SbO}_3, \bar{\text{T}}_{10} + 2\text{Aq}$, is one of the most valuable articles in the whole *Materia Medica*. This salt, obtained by a process which is given in the pharmacopœia, occurs in the form of square prisms, which are soluble in about 15 parts of cold water and in 2 parts of boiling water. This salt is somewhat efflorescent, and when dried at 212° loses all its water of crystallization; its solution slightly reddens litmus, throws down an orange-colored sulphide of antimony, if a current of sulphureted hydrogen is passed through it, and has a very peculiar nauseous, metallic taste.

There is no very delicate test for tartaric acid. Its presence in a moderately strong solution may be detected by the addition of acetate of potash, when a sparingly soluble bitartrate is soon separated, especially if the mixture be well stirred. All the tartrates on charring emit a peculiar odor resembling that of burned sugar.

A remarkable metameric modification of tartaric acid is known as *racemic* or *paratartaric acid*, $2\text{HO}, \text{C}_6\text{H}_4, \text{O}_{10} + 2\text{Aq}$. It is a frequent associate of tartaric acid, but is especially abundant in the grapes of the Voges district. While in most respects it exhibits a close resemblance to tartaric acid (the two acids having the same composition, yielding, when exposed to heat, the same products, and their salts corresponding in the closest manner), it may be distinguished and separated from it by the following points of difference. It crystallizes more readily from solution; it contains two equivalents of water of crystallization; it is less soluble in alcohol; and the racemate of lime is soluble in hydrochloric acid, and is precipitated unchanged on adding ammonia. Its most important difference, however, is, that its solution does not rotate the plane of polarization, while a solution of ordinary tartaric acid exerts a well-marked right-handed rotation.

The brilliant researches of M. Pasteur on the optical and chemical properties of tartaric and racemic acids, have opened up a new and most important field of investigation in relation to the molecular composition of organic bodies. We shall give the briefest possible abstract of his remarkable discoveries, and must refer for fuller information to his numerous memoirs in the *Comptes Rendus*, *Annales de Chimie*, and other French scientific journals. He has proved that racemic acid is a mixture of ordinary tartaric acid (to which, from its optical property, he applies the term *dextro-racemic acid*) and of an acid which produces left-handed rotation, to which he gives the name *levo-racemic acid*. (These acids are also known as *dextro-tartaric* and *levo-tartaric acids*.) He found that, by saturating racemic acid with soda and ammonia, and allowing this solution to crystallize slowly, two varieties of crystals are obtained, which may be distinguished by their form, in the same way as the image and the reflection of the image in a mirror differ; or as right-handed and left-handed. If the two kinds of crystals are separated, and then dissolved, each solution is found to act powerfully on polarized light, but in opposite directions. On separating these acids from their bases, and mixing equal parts of concentrated solutions of each, racemic acid is again formed, which exerts no action on a polarized ray. M. Pasteur has subsequently made the discovery, that racemic acid may be artificially produced by the action of heat upon certain compounds of tartaric acid (such as tartrate of cinchonine or tartaric ether), which are capable of resisting a high temperature. The formation of racemic acid in this way is accompanied by the production of another modification of tartaric acid, which he calls *inactive tartaric acid*, which, like racemic acid, has no action on polarized light, but unlike it, cannot be resolved into dextro and levo-racemic acids.

Tartaric acid and the tartrates, in their relation to medicine, are of considerable importance. Pure *tartaric acid*, in small doses diluted largely with water, forms a good refrigerant drink in febrile and inflammatory affections, and is much employed for this purpose in hospitals, etc., as being cheaper than citric acid. It has been stated that persons addicted to habitual drunkenness have been reclaimed by the following treatment: A few crystals of the acid are dissolved in two small tumblers of water, and taken in the morning fasting, an hour intervening between the tumblers. The painful feeling of sinking and craving of the stomach, of which such persons usually complain, is said to be removed by these acid draughts. Under the name of *acidulated drops*, lozenges composed of this acid, sugar, and oil of lemons are largely employed in mild sore throats and colds. The principal medical use, however, of tartaric acid is in the preparation of effervescent draughts, when added to alkaline carbonates; and in the composition of scidlitz powders (q.v.). *Tartrate of potash* is a mild but efficient purgative in doses of from two to six drams, which is perhaps hardly so much used as it deserves. In passing through the system it becomes converted into carbonate, and thus renders the urine alkaline. *Acid tartrate*, or *bitartrate of potash*, commonly known as *cream of tartar*, in full doses, acts as a sharp purgative, but is generally prescribed with some of the milder vegetable cathartics. When administered in small repeated doses (from a scruple to a dram), in a large quantity of water, it largely increases the secretion of urine, and is consequently of great service in dropsy. It may be agreeably given in either of the following forms: (1) *Imperial*, which is prepared by dissolving a dram of cream of tartar in a pint of boiling water, and flavoring with lemon peel and sugar. In incipient dropsy, a couple of tumblers of this mixture, with half a glass of good holland

in each, are strongly recommended by Dr. Neligan as an after-dinner drink. The proportion of cream of tartar to the pint of water may be gradually increased to two drams. (2) *Cream of tartar whey* is prepared by boiling 100 grains of the salt in a pint of new milk, and removing the curds by straining. Either of these drinks may be safely taken to any extent agreeable to the patient. *Tartrate of iron and potash*, the *ferrum tartaratum*, or *tartarated iron*, of the pharmacopœia, is a mild chalybeate tonic, which, in consequence of its somewhat sweet taste, is well adapted for children. It occurs in transparent scales of a deep garnet color, is soluble in water, and sparingly soluble in spirit. The dose varies from 5 grains to a scruple, three times a day, either given with honey or treacle, or dissolved in some aromatic water. The *wine of iron* (*vinum ferri* of the *Pharm. Brit.*) consists of sherry with tartrated iron in solution. Each dram ought to contain one grain of the salt. The *tartrate of iron and ammonia*, or *ammonio-tartrate of iron*, closely resembles in its action the tartrate of iron and potash. Although not in the *Pharm. Brit.*, it is "an excellent preparation of iron, void of all astringency. Its not disagreeable taste, its solubility in water, its compatibility with the alkaline carbonates, and the permanency of its composition, give it an advantage over most of the other preparations of iron. It is peculiarly suited as a tonic for those derangements of the uterine organs in which ferruginous salts are indicated,"—*Neligan's Medicines*, 6th ed. p. 645. The dose is from 5 to 8 grains, and it may be prescribed in the form of powders, pills, or solution; or made into a bolus with honey. *Tartar emetic*, in doses of from $\frac{1}{12}$ to $\frac{1}{2}$ of a grain, frequently repeated, acts as a diaphoretic or sudorific; nausea sometimes accompanies the diaphoresis, but it has the advantage of increasing the tendency to perspiration. The addition of the compound tincture of lavender tends to prevent the supervention of vomiting. Tartar emetic in these small doses is of great service in febrile disorders, in the hæmoptysis of phthisis, in obstinate cutaneous diseases, etc. *Antimonial wine* consists of sherry holding tartar emetic in solution in the proportion of two grains to the ounce. The dose, to produce a diaphoretic action is 20 or 30 minims every hour. If we require an expectorant action—as in acute pneumonia or bronchitis—the salt should be given in still smaller doses, as from $\frac{1}{16}$ to $\frac{1}{12}$ of a grain. Tartar emetic, in doses of two or three grains, dissolved in water, acts as a powerful emetic, and at the same time produces much nausea and depression, and not unfrequently purging. The vomiting seldom occurs till about 20 minutes after the draught has been taken. If tartar emetic is thus given at the commencement of febrile or inflammatory affections, it will often cut short the impending disease. With this view it is employed in continued fever, croup, whooping-cough, etc. It used to be given to relax the muscular system, in cases of strangulated hernia and dislocation; but chloroform is far better for these objects. In cases of poisoning it is inferior to sulphate of zinc. It is expedient to take the emetic dose in parts, as too powerful an effect is thus prevented. Two grains, which are generally sufficient, must be dissolved in eight ounces of water, of which a quarter should be taken every ten minutes till vomiting ensues. The patient should walk gently about his room between the doses. If a large dose (of one, two, or even three grains) be repeated every second hour, the nausea, vomiting, and purging (which often follows a full dose) cease after two or three such doses, and the main action seems to be exerted in depressing the circulation and lowering the pulse. Hence, tartar emetic given in this way is a direct sedative or contra-stimulant, and is of great service in pneumonia and pleurisy. "As a contra-stimulant," says Neligan, "tartar emetic is given in doses of from half a grain to two grains every hour or second hour, dissolved in one or at most two ounces of orange-flower water. The first dose or two should not exceed half a grain, and the patient should not be permitted to drink, so as, if possible, to avoid the production of vomiting. When once a tolerance of the medicine is produced in the system, the quantity taken may be rapidly increased."—*Op. cit.*, p. 418. Lastly, tartar emetic, when applied to the skin, produces a crop of pustules, which ulcerate, and discharge purulent matter. In consequence of this property, tartar emetic, either in the form of ointment or of saturated solution, is often employed as a counter-irritant in various affections of the viscera of the chest and abdomen, in diseases of the joints, etc. The ointment is applied by rubbing about half a dram on the skin night and morning. In two or three days pustules begin to appear, when the further application of the ointment should be temporarily suspended. The saturated solution is a cleaner preparation than the ointment, and acts more speedily. It is applied by means of pledgets of lint soaked in it. Tartar emetic, in excessive doses, or in small repeated doses, acts as an irritant poison. Dr. Taylor has reported 37 cases of poisoning by this agent, of which 16 were fatal. The smallest fatal dose was in a child *three-quarters of a grain*, and in an adult *two grains*, but in the last case there were circumstances which favored the fatal action of the poison. The symptoms occurring in chronic poisoning by this salt are "great nausea, vomiting of mucus and liquids, great depression, watery purging, followed often by constipation of the bowels, small, contracted, and frequent pulse, loss of voice and muscular strength, coldness of the skin, with clammy perspiration, and death from complete exhaustion." A considerable number of cases are on record in this country in which murder has been perpetrated by the slow action of tartar emetic. The most important of them are referred to by Dr. Taylor in his *Medical Jurisprudence*, pp. 146 and 250, to which must be added the Pritchard case in Glasgow, 1865. The *Pharmaceutical Journal* for Oct., 1865, contains direc

tions, by Messrs. T. and H. Smith, of Edinburgh, for preparing an antidote to be prescribed after a large dose of tartar emetic has been taken. The ingredients are solution of perchloride of iron and calcined magnesia.

TARTARS, or, more properly, **TATARS**, was originally a name of the Mongolic races, but came to be extended to all the tribes brought under Mongolic sway by Genghis Khan and his successors, including Tungusic and Turkic races. The term is therefore not to be considered as ethnological, though all, or almost all, the peoples included under it, in its widest sense, belong to the Turanian family, but is rather to be understood in the same sense as the term "Franks" used by Mohammedans. In the classification of languages, Tartaric has become the distinctive name of that class of Turanian languages of which the Turkish is the most prominent member, while the Mongolic form a separate class. See **TURANIAN LANGUAGES**.

TARTARUS (Gr. *Tartaros*; the name is probably onomatopœic, the reduplication being designed to express something terrible or disagreeable, like *Barbaros*, *Karkaron*, and many other words), according to Homer, is a deep and sunless abyss, as far below Hades as earth is below heaven, and closed in by iron gates. Into Tartarus, Zeus hurled those who rebelled against his authority, as e.g., Kronos and the Titans. Afterward the name was employed sometimes as synonymous with Hades or the under-world generally, but more frequently to denote the place where the wicked were punished after death—lowest hell, in fact. A noticeable feature about these punishments is their congruity with the nature of the offenses perpetrated. See **HEAVEN** and **HELL**.

TARTARY (properly **TATARY**) is the name under which, in the middle ages, was comprised the whole central belt of central Asia and eastern Europe, from the sea of Japan to the Dnieper, including Manchuria, Mongolia, Chinese Turkestan, Independent Turkestan, the Kalmuck and Kirghis steppes, and the old khanates of Kasan, Astrakhan, and the Crimea, and even the Cossack countries; and hence arose a distinction of Tartary into European and Asiatic. But latterly the name Tartary had a much more limited signification, including only that tract bounded on the n. by Siberia, and on the s. by China and Thibet, along with Independent Turkestan; and at the present day, many writers apply it as a synonym for Turkistan (q.v.).

TARTINI, GIUSEPPE, 1692-1770; b. Pirano, Italy; received lessons in music, violin-playing, and fencing; studied law; married privately at Padua, and to avoid arrest by the bishop fled to a convent, where for two years he gave himself to the study of the violin, receiving lessons in composition from father Boemo, the organist of the convent; appointed chief violinist of the chapel of St. Anthony at Padua, 1721; established, 1728, at Padua a violin school of great celebrity. He left in MS. 48 violin sonatas, 1 trio, 127 concertos, besides his published works. *Sonate du Diable*, or *Tartini's Dream*, he considered his best composition.

TARTRALIC ACID and **TARTRELIC ACID**. See **TARTARIC ACID**.

TARTUFE, the name of the chief character in Molière's most celebrated comedy, which has become a synonym in all languages for a hypocritical pretender to religion. The original of the character was most probably a certain abbé de Roquette, a parasite of the prince de Conti. The name is said to have suggested itself to Molière on the occasion of a visit to the papal nuncio, where he saw the pious and solemn countenances of the nuncio's courtiers suddenly lighted up with ecstatic animation by the appearance of a seller of truffles—in Italian, *tartuffoli*. This play excited a greater commotion than perhaps any other production of the kind ever did. It was written in 1664; but before it was brought on the public stage, partial representations of it in private companies had made its character known, and raised the alarm of the priests, who believed themselves to be specially satirized therein. Uniting with the many enemies whom Molière had already made for himself by lashing physicians, fops, and fools of all kinds, they used every means in their power to prevent the public representation of the play. The archbishop of Paris threatened with excommunication all actors who should take any part in the performance, and even those who should only read it; and one dignitary went so far as to declare that Molière—whom he called a devil in human form—was deserving of the stake. It was not till 1669 that Molière succeeded in getting the play publicly acted in presence of Louis XIV.; and then it had an uninterrupted run for three months, to the great vexation of all hypocrites.

TARUDANT, a city in the province of Soos, Morocco; about 4 m. from the Soos river, and 150 m. s.w. from Morocco; pop. about 50,000. It is walled and defended by a citadel. Most of the houses have but one story, and the streets are narrow and crooked. The city is surrounded by a highly cultivated country, and itself contains many groves and gardens. Its chief manufactures are of copper, leather and dyes.

TASCHEREAU, ELZÉAR ALEXANDRE, b. Quebec, 1818; educated at the Quebec seminary. He entered the Roman Catholic priesthood in 1842; was for some time professor of mental philosophy, and superior in the Quebec seminary, and became professor of canon law at Laval university in 1856. He became administrator of the Quebec diocese in 1870, and archbishop of Quebec in 1871.

TASHKAND, till recently a t. of Independent Turkistan, but now in the possession of Russia, is situated in the khanate of Khokan, 92 m. n.w. of Khokan, the capital on the n. bank of the Saralka, a small feeder of the Dzhirhik river, an impetuous torrent, which empties itself into the Sir-Daria. It is the chief commercial town in the district, is the center of the transit-trade between Bokhara, Khokan, and Chinese Tartary, and has extensive trading relations with Orenburg and Petropavlovsk. Like most of the cities of central Asia, it stands in a fertile plain. It covers a large tract of ground, being said to extend 10 m. in one direction and 5 in another, and is protected by a high wall of sun-dried bricks. Within the walls are numerous gardens and vineyards, interspersed among the houses; the houses themselves are built of mud, and thatched with reeds. The streets are narrow and dirty. The chief buildings are the castle (which is fortified), various mosques, colleges, old temples, and a bazaar. The chief manufactures are gunpowder, silk and cotton goods, and iron. According to a census taken in 1871, the pop. amounted to 78,125. Tashkand is also important in a military point of view, and, mainly for this reason, had been long coveted by Russia. The Russians, who captured it in 1854, and retained it for a short time, finally took possession of it in 1865, having in the mean time made great advances in central Asia. The petition of the inhabitants, that they might be received as Russian subjects, was granted in 1866; and since then it has been governed by a kind of municipal board, the president being a Russian officer, and the members chosen by the townspeople.

TASMAN, ABEL JANSSEN, b. Hoorn, n. Holland, about 1600; was sent, 1642, by Van Diemen, governor-general of the Dutch East India company to explore New Holland, and on Nov. 24 discovered the island which he called Van Diemen's Land (now Tasmania). After a voyage of 10 months, in which he discovered New Zealand, the islands of the Three Kings, the Friendly, and Feejee islands, he returned to Batavia. He made a second voyage to New Guinea and New Holland, 1644; but we have no details of it, as he never returned. He published an account of his first voyage.

TASMANIA, formerly VAN DIEMEN'S LAND, a considerable island in the South Pacific ocean, between the parallels of 40° 40' to 43° 40' s. lat., and between 144° 30' to 148° 30' e. long., lying to the s. of, and separated from Australia by Bass's strait. Its greatest length, from cape Grim, on the n.w., to cape Pillar on the s.e., is 240 m.; and its greatest breadth from e. to w., 200 m.; its area, including the adjacent islands, about 26,300 sq. miles. The capital is Hobart Town, with a pop. of 20,000, situated at the base of Mt. Wellington, on the western shore of the estuary of the river Derwent. The second chief town is Launceston, with a pop. of 10,668, situated at the head of the estuary of the Tamar, formed by the junction of the North and South Esk rivers. In the year 1854 the population consisted of—males, 30,613; females, 28,261; total, 64,874. In 1874, males, 55,117; females, 49,059; total, 104,176. Total pop. in Dec., 1877, 107,104. Hobart Town and Launceston are connected by the electric telegraph, and by an excellent macadamized road, 121 m. in length, from which good roads branch off. In 1878 there were 630 m. of telegraph. The first line of railway, 45 m. in length, was opened in 1871, uniting Launceston with Deloraine: there are in all about 180 m. of railway.

Physical Features.—The south-eastern coast of Tasmania is deeply indented by the estuaries of the Derwent and Huon, Storm bay, the inlet of Pitt Water, and Frederick Henry bay. The last is protected on the s.e. by Tasman's peninsula, reserved as a penal settlement for the colony. The chief indentations on the w. coast are Macquarie harbor (formerly a penal settlement, but now uninhabited), and Port Davey. On the e. coast are Oyster bay, between Freycinet's peninsula and the mainland; and Spring bay, sheltered on the e. by Maria island. On the n. coast, besides the estuary of the Tamar, there are numerous smaller harbors and rivers, accessible to vessels of from 30 to 300 tons. The chief of these are Circular Head, Port Sorell, and the rivers Mersey, Forth, Leven, Don, and Inglis. The scenery is of a bold mountainous character, varied by deep narrow valleys, extensive undulating tracts of country, and open plains of limited extent. Among the principal mountains are Ben Lomond (5,002 ft.), Cradle mount (5,069 ft.), Ironstone mount (4,736 ft.), Mt. Barrow (4,644 ft.), Mt. Wellington (4,166 ft.), with many others exceeding 4,000 ft. in height. Embosomed among the central mountains, at an average height of about 3,000 ft., are numerous lakes, with a united area of about 170 sq.m., which feed the greater part of the rivers draining the s.e. slope of the island. With the exception of the reclaimed lands, the basaltic plains, and limited tracts which are unfavorable to the growth of timber trees, the whole island is more or less densely wooded. The vast forests of the western portions of the n. and s. coasts are extensively utilized for timber, and in the former, the work of reclaiming the rich heavily-timbered lands is rapidly progressing. But the major part of the western half of the island is entirely uninhabited, its soil, climate, and inaccessible position offering little inducement to the settler.

Geology and Mineralogy.—The bed-rocks of the western districts, from Bass's strait to South-west cape, consist of vast bands of slates, schists, and quartz rock, belonging to the azoic or metamorphic series. Next to these come lower paleozoic slates, with conglomerates and dark compact limestones, the latter highly charged with Silurian fossils. Unconformably upon the upturned edges of these rocks lie upper paleozoic sandstones, mudstones, limestones, and conglomerates, also traversed by dikes and masses of green-

stone and basalt, and with these, reaching an altitude of 4,000 ft. above the sea-level. In the s.e. districts, from the South Esk river on the n. to the Huon on the s.w., the lower rocks are entirely absent, or concealed beneath the upper paleozoic beds. In the n.e. district, the lower rocks again make their appearance, associated with granite and greenstone, and occasionally traversed by dikes and veins of the true auriferous quartz. Here, again, they are overlaid by upper paleozoic rocks, extensively denuded, and exposing seams of coal from 2 ft. to 14 ft. thick, at various elevations. Tertiary rocks are sparingly distributed. At the mouth of the river Ingalls, on the n. coast, are beds of a whitish free-stone, attaining in places a thickness of 120 ft., and containing recent shells, with extinct species of *irigoniu*, *terebratul*, *cyprea*, *rolata*, etc. Tertiary lignites are found in the sandy clays of the valleys of the Derwent and Tamar, with impressions of leaves of unknown trees and plants. Over the greater part of the basin of the South Esk, comprising an area of more than 1000 sq.m., extensive deposits of clays, sands, and quartz drift are met with. No distinct traces of glacial action have been observed; but the thick beds of gravel, and the boulders, which must have traveled many miles from their parent rock, afford evidence of some powerful transporting agency, and were probably deposited in their present sites by the action of icebergs slowly drifting northward at some period prior to the last general elevation of the land.

The igneous rocks are everywhere present in great variety. The islands of the Furneaux group in Bass's strait are chiefly of granite, and form the connecting links which join the n.e. angle of Tasmania to the great dividing range of eastern Australia. Gold has been found in many places, and the workings have for years given fair returns to a limited number of miners. In 1875, the quantity of gold produced was 3,010 ounces. Silver and antimony have been occasionally met with in the gold drifts, and very rich deposits of tin have begun to be worked at Mount Bischoff. In the six months ending June, 1877, 900 tons of tin ore were shipped. Copper occurs in thin veins, associated with galena, on the n. coast, near the river Leven, and galena has been found elsewhere in the primitive limestones. Red and brown hematites, containing a large percentage of iron, occur at various points on the n. coast, in large masses and lodes. Iron-works on an extended scale are now in operation; in 1874 the produce was 1400 tons. Coal is worked in several parts of the island, chiefly for local consumption. A large lode of bismuth was discovered in 1875. The older limestones yield fine varieties of marble, and excellent building stone is obtained from the greenstones, basalts, and paleozoic sandstones.

Botany.—The flora of Tasmania has been fully described in the botany of the antarctic voyages by Hooker and others. The majority of the species are common to Australia and Tasmania. Of those which are peculiar to the latter, many are limited to particular localities. The most widely diffused genera are the eucalypti and acacia, the former yielding the ordinary timber of the colony. The blue gum (*eucalyptus globulus*) reaches a height of 350 ft., with a corresponding girth. The blackwood (*acacia melanoxylon*) and the huon pine (*dacrydium franklini*) also yield valuable timber, which, together with the hardwoods from the eucalypti, is largely exported to the neighboring colonies. A species of beech (*fagus cunninghamii*), locally known as the myrtle, and growing in great abundance in some parts of the island, also produces a highly valuable timber, which has not yet received the attention which it merits. There are many beautiful shrubs and plants, but the flowers are usually small and inconspicuous. All the common fruit-trees and culinary vegetables of England have been introduced, and grow with great luxuriance and vigor. Oranges and lemons are cultivated in some situations, but do not usually ripen their fruit. The introduction and cultivation of exotic trees and plants is energetically carried on in the botanical gardens under the direction of the Royal society.

Zoology.—Of the 40 species of mammals, one-half belong to the sub-class *aplacentalia*, comprising the *marsupialia* (kangaroo, wallaby, opossum, wombat, etc.), and two species of the singular order *monotremata* (ornithorhynchus and echidna). Among the marsupial animals peculiar to Tasmania, the chief are the thylacine (*thylacinus cynocephalus*) and the Tasmanian devil (*dasypus ursinus*), both of which are sometimes very destructive to sheep in the outlying districts. The skin of the kangaroo is much prized for leather, and there is always a market for opossum fur. Whales and seals, formerly very abundant on the coasts, are now rare; but whaling is still extensively carried on in the adjacent seas. The birds of Tasmania have been admirably described by Gould. The majority are identical with Australian species. The emu is extinct, and black swans are seldom seen in the settled districts. There is abundance of native game, which is now protected by act of parliament during the breeding season. A species of puffin (*Puffinus brevicaudus*), locally known as the mutton-bird, frequents some of the islands in Bass's strait in countless numbers, and many thousands are annually slaughtered for the sake of their oil, and for food by the half-caste islanders. Fish are plentiful in the seas and rivers, the best being known by the local name of trumpeter, and reaching a weight of 40 lbs. There are 13 species of snakes, most of which are venomous, but accidents from their bite are of very rare occurrence. Many species of insects and crustaceans have been described by Erichson, Gray, Gunther, and others. A comprehensive and accurate account of the fauna of Tasmania is still however, a desideratum.

Fallow-deer, and several of the English game-birds, have long been naturalized, and salmon have been introduced after several unsuccessful attempts.

Climate, Soil, Produce, &c.—The climate of Tasmania is fine and salubrious. From observations taken at Hobart Town, and extending over a period of twenty years, the extreme of heat appears to be 105°, and of cold 29° 8'. The mean temperature of the hottest month (January) is 63° 57', and of the coldest (July), 45° 82', and of the whole year, 51° 92'. In some parts of the island, the temperature, even in winter, rarely sinks to 45°. Snow seldom falls in the settled districts, and does not lie on the ground except on the high table-lands of the interior. The average annual rain-fall at Hobart Town is 21.52 in., and the average for the rest of the island about 35 in., except in the western country and the high lands, where a fall of 75 in. has been registered in the year.

The agricultural lands may be divided into three classes—alluvial deposits, tertiary clays, and loamy soils, derived from the decomposition of different kinds of basalt. In their virgin state, some are marvelously productive. On new land, 100 bushels of oats, 70 bushels of wheat, and 15 tons of potatoes per acre, are not uncommon crops. The fertility of the soil has encouraged a system of slovenly farming. In many instances, the land has been cropped with wheat and oats for upward of thirty years without any application of manure, or any rest save an occasional summer fallow. The export trade in the staple articles of produce has much fallen off of late years, partly because the neighboring colonies have begun to depend more upon their own resources, but partly also through the deterioration of the soil from improvident management, and the necessarily increased cost of production. There are skilled and careful farmers in every district, but they are exceptions to the rule. The open pastoral lands are admirably adapted for sheep. The wool from some of the larger establishments is much valued, and brings the highest price in the London market. The cattle and agricultural horses of some of the northern districts are unsurpassed in the colonies. Pastoral and agricultural associations have been formed to promote improvements in the system of farming, and to encourage the breeding and importation of pure stock. The extent of alienated land is over 4,000,000 acres, of which about 340,000 acres are under cultivation. In 1875 the number of horses in the colony was 23,208; of cattle, 110,450; and of sheep, 1,714,168. In 1876 the exports amounted to £1,130,988, the chief staple article being wool; the imports were £1,133,003. In 1876-77 the yield of wheat was 752,070 bush.; barley, 147,536 bush.; oats, 571,485 bush.; potatoes, 27,289 tons; hay, 35,907 tons; hops, 839,514 lbs.

Administration.—Since the passing of the "constitutional act" in 1854, the governing authority has been vested in a parliament, consisting of the governor as the queen's representative, and two elective houses, the legislative council of 16, and the assembly of 32 members. The qualification of voters is, for the former, a freehold of the annual value of £30, or a leasehold of £200; and for the latter a freehold of the value of £50, or the payment of £7 house rental. Graduates of British universities, and all holding a commission in the army or navy, or in holy orders, are entitled, *ex officio*, to vote at the election of members of both houses. The revenue for the year 1877 was £361,771, of which there was derived from the customs the sum of £201,966. The expenditure for the same period was £352,564; and the public debt, £1,589,705. The upset price of land is £1 per acre, payable by installments extending over eight years; but lots which remain unsold after being offered for sale by public auction, may be purchased, under certain restrictions, at greatly reduced rates. In the unsettled districts, large tracts of land are obtainable at nominal prices. In 1862 an act, known as "Torrens's real property act," was passed to facilitate the transfer and conveyance of land. Property which had been brought under the operation of this act can be conveyed, without reference to value, upon payment of 10s. registration-fee, £1 for new certificate of title, and 2s. for forms. Mortgages can be effected on equally moderate terms. At the end of 1874, the land rented from government amounted to 1,308,400 acres, producing a rental of £5,898.

Religion and Education.—By the constitutional act, £15,000 is annually reserved for the support of religion, and is at present divided among the various religious denominations according to their respective numbers at the census. By a return in 1870, there were: Church of England, 53,047; Roman Catholics, 22,091; Presbyterians, 9,034; Wesleyans, 7,187; Independents, 3,931; Baptists, 931; Jews, 232. The state grants are largely supplemented by endowments and by local contributions. For the support of elementary education, £12,000 a year is appropriated by parliament, the disbursement of which is intrusted to a central board, holding its sittings in Hobart Town. The system is based upon the principles established by the Irish national board. The teachers are appointed by the board, and are under the supervision of the inspector of schools. In 1854, the total number of schools was 50, at which the average attendance of pupils was 2,624. In the beginning of 1877 there were upward of 165 schools supported by the government, 297 teachers, 12,557 children on the rolls, with an average daily attendance of 5,973. Of the entire population about 60 per cent can both read and write; about 25 to 30 per cent are unable to read.

For the promotion of higher education, provision is also made by the legislature. Two scholarships, each of the value of £200 a year, and tenable for four years at either of the English universities, are annually open to competition under the direction of the

council of education, and exhibitions to the higher schools, with other local honors, are periodically awarded by the same body.

Aborigines.—The number of the aborigines at the first colonization of Tasmania has been variously estimated, but probably at no time exceeded 3,000. There were several tribes occupying distinct parts of the island, and differing from each other in dialect and customs; but of a generally uniform type more nearly allied to the Negritos of New Guinea than to the aborigines of Australia. The average height of the men was from 4½ to 5½ ft.; of the women, considerably less. Color, a bluish black; the facial angle 75° to 80°; eyes, dark brown, with jet-black pupils; hair, sometimes lank, but generally crisp or woolly; forehead, high and narrow; limbs, lean and muscular; feet, flat and turned inward. Polygamy appears to have been tolerated: the women performed all menial duties, and were specially charged with that of carrying fire from place to place, when the temporary encampment was broken up. Their usual shelter was a "break-wind," constructed of boughs, but traces of rude huts have been observed. In summer, they went entirely naked, at other times wearing coverings made from the skins of the kangaroo and opossum, which formed their chief food. The coast tribes, at certain times of the year, lived almost exclusively on shell-fish, and the remains of their feasts have often been mistaken for recent marine deposits. Among other articles of food were the roots of the esculent fern, the heart of the tree-fern, and grass-tree (*xanthorrhoea*), the seeds of the boobialla (*acacia sophora*), and a singular fungus (*mytilus Australis*), commonly known as "native bread," which grows under ground near the roots of decayed trees. No traces of cannibalism were observed. Their only weapons were the spear and waddy, a wooden club about 2 ft. 4 in. in length. The early relations between the settlers and aborigines were friendly; but as the latter were gradually dispossessed of their favorite hunting grounds, they became inveterately hostile. Shot down without mercy by the settlers, they revenged themselves by bloody reprisals, and for many years the unequal struggle continued, until their numbers were reduced to a few hundreds. In 1830, an attempt was made to drive the whole body into Tasman's peninsula, by means of a cordon extending across the whole island, and gradually closing in toward the s.e.; but it failed ridiculously, as might have been foreseen. In the following year, Robinson, a builder of Hobart Town, undertook to conciliate the surviving remnants of the various tribes, with a view to their removal to Flinders island, and this he successfully accomplished, after four or five years of patient, self-denying labor. In spite of all the care bestowed upon these unfortunate people their numbers rapidly decreased, and only 45 remained when the settlement was removed, in 1847, to a more convenient station at Oyster cove, near Hobart Town. There were in 1865 only six remaining. No children had been born among them for many years, and the race is now wholly extinct, the last of the number having died a few years ago.

History.—The island was first discovered by Tasman on Dec. 1, 1642, and named by him Van Diemen's Land, in honor of his patron, the then governor of the Dutch possessions in the East Indies. During the next century, no visit is recorded; but between 1772 and 1802, partial surveys and explorations were made by English and French navigators. In 1803, lieut. Bowen was dispatched from Sydney with a few soldiers and convicts to form a settlement in the s. of Tasmania, which was finally fixed on the spot where Hobart Town now stands. In 1804, a settlement was formed near the mouth of the Tamar, which was removed in 1806 to the spot now occupied by the town of Launceston. From 1817, commenced a rapid increase in the number of free settlers, who received grants of land in proportion to the capital which they brought into the colony, and were subsequently further aided in the clearing and cultivation of their estates by the assignment of convicts as their servants. In 1825, Tasmania was declared independent of New South Wales.

The colony was for a good many years agitated by the question of the disposal and management of the convicts, who were now becoming a prominent and formidable element in the community. At last, in 1853, transportation to Tasmania and New South Wales was finally abandoned by the home government. The abolition of transportation, and the consequent cessation of a vast imperial expenditure, naturally produced a considerable depression in all branches of trade, especially in the southern districts. It is not surprising that the great body of the colonists, instead of setting themselves manfully to turn the true and natural resources of the country to the best account, have rather looked for some great discovery of rich gold-fields, or some gigantic works undertaken under the auspices of government, as the only means by which the prosperity of the colony was to be assured. But such a state of things must ultimately work its own cure. Viewed in a true light, the progress, social, material, and political, has presented a more hopeful aspect since the extinction of the convict system than at any earlier period. For years after the discovery of gold in Australia, the *expatriates* of Tasmania flocked in crowds to the neighboring colonies, attracted by the prospect of richer gains, and glad to escape from police surveillance in a country where their antecedents were too well known. Those who remained had, for the most part, by this time become orderly, well-conducted members of the community, not to be distinguished from the immigrant population by whom they were surrounded. Necessity will in due time develop the enterprise and energy which have too long lain dormant. Some of the older settlements may prove inadequate to the maintenance of their former

population, but the rich lands of the n. coast offer to industrious settlers a field which is practically inexhaustible.

TASMAN NIA, a genus of shrubs of the natural order *magnoliaceæ*. *T. aromatica* is an evergreen bush of Van Dieman's land, growing in the richest soils on the margins of rivers and in shady ravines, and sometimes forming thickets of large extent. Every part of the plant is highly aromatic and pungent. The fruit is occasionally used as pepper. This shrub requires protection from frost in England.

TASSAERT, NICOLAS FRANÇOIS OCTAVE, 1800-74; b. France; studied art at the Paris school of art and under eminent masters of painting. His first picture was exhibited in 1831. His field was wide, including historical and *genre* pieces as well as portrait-painting. Among his best productions are "Le Marchand d'Esclaves;" "Le Sommeil de l'Enfant Jésus," and "Funérailles de Dagobert à Saint Denis."

TASSIN, A. G., b. France, 1843; educated at the St. Cyr military school of France; was appointed 1st lieut. 35th Ind. vols., 1861; capt., 1863; maj., 1864; col., 1865; brevetted brig.gen. and maj.gen. for gallantry. He resigned to accept commission in the French army during the Franco-Prussian war; was made knight of the legion of honor. He was afterward reappointed by pres. Grant, and is col. in the U. S. army. He is author of *Northern California Indians*; *The Indian Tribes of the Pacific Coast*; *The Flora of Arizona*; and translations of military works.

TASSISUDON', the capital of Bhotan (q.v.), stands on the right bank of the Godadda, an affluent of the Brahmaputra, in lat. 27° 30' north. Many of the inhabitants, the number of whom has not been ascertained, are employed in manufacturing paper, and in making brass images and ornaments for their places of worship.

TASSO, BERNARDO, an Italian poet of considerable distinction, but most famous as the father of the illustrious Torquato, was b. at Bergamo, Nov. 11, 1493. Both by his father's and mother's side he was connected with the ancient family of the Tassi, known in the 13th c. for having organized and superintended the postal service in Italy, Spain, and Germany. His uncle, Luigi Alessandro, bishop of Recanati, took charge of his education, and under his care he turned out a fine classical scholar, his love of poetry at the same time becoming every year more ardent. The assassination of the cardinal in 1520, deprived him at once of protection and support, and for several years he wandered about Italy in a rather necessitous condition. Like his son, he was exceedingly fond of the patronage of noble lords and the smiles of noble ladies. After 1525 we find him high in favor with persons of influence. Guido Rangone, gen. of the pontifical forces, intrusted him with several missions, among others to the prince of Salerno, who appointed him his secretary; and Tasso accompanied the prince on the expedition against Tunis in 1534. In 1539 he married, at Salerno, a young lady of Sorrento, Porzia de' Rossi, who added genuine merit to the advantages of birth, beauty, and fortune, and by whom he became the father of Torquato. The fall of the prince of Salerno (who had incurred the enmity of Charles V.) brought with it the ruin of Tasso's worldly prosperity, and he was obliged to seek for a new patron. He was not long in finding friends. Guidubaldo, duke of Urbino, and Guglielmo, duke of Mantua, strove for the honor of attaching the poet to their court. The latter succeeded, and named him governor of the city of Ostiglia, where he died Sept. 4, 1569.

Tasso's principal writings, chronologically arranged, are: *Rime* (Ven. 1531); *I tre Libri degli Amori* (Ven. 1537); *Ode e Salmi* (Ven. 1560); *L'Amadigi*, *Poema* (Ven. 1560); and *Il Floridante*, *Poema* (Mant. 1587). Of these the principal is *L'Amadigi* (Amadis), which some Italian critics have not hesitated to place above the poem of Ariosto; but without adopting this extravagant estimate, we may justly admire it for the sweetness and elegance of its language, and for the beauty of its descriptions and comparisons.—For a good idea of the politics and literature of the time, see Seghezzi's edition of his *Lettere* (3 vols., Padua, 1733-51), to which there is prefixed a biographical notice.

TASSO, TORQUATO, one of the greatest poets of Italy, was the son of the preceding, and was born at Sorrento in Naples, Mar. 11, 1544. His earliest education was received from the Jesuits. During his childhood, Tasso's father was an exile, but the affectionate solicitude of his mother well supplied the want of paternal care. In 1554 he went to Rome to join his father, and left his mother (whom he was destined never again to see) in a convent at Naples. At Rome, and subsequently at Bergamo, Urbino, Pesaro, and Venice, he continued to prosecute his studies. He assisted his father in copying, correcting, and even in completing his poem *L'Amadigi*, though as yet only 16 years of age. No wonder old Bernardo was delighted at the promise shown by his son, and prophesied in his letters that Torquato would yet become a great man. Later, however, sad experience of the miseries of a poet's life induced him to send Tasso to Padua, to study jurisprudence under the celebrated Panciroli. But whom the gods have made poetical can never sink into a lawyer. The youth remained at Padua a year, and wrote *Rinaldo* (Venice, 1562), a poem in 12 cantos, the hero of which is the son of Aymon, and cousin of Roland. It belongs, therefore, to the class of heroic romances. After the first burst of anger was over, Bernardo forgave his son for following his example rather than his precept, and became prouder of Tasso's genius than ever. Tasso now betook himself to the university of Bologna, to study philosophy, and is said to have distinguished himself

by an extraordinary facility in the discussion of the most elevated and abstract themes—a circumstance that perhaps says more for his power of rhetoric than his power of speculation. On leaving Bologna, he spent some time with friends at Castelvetro, Modena, and Corregio, but returned to Padua at the request of his friend Scipio de Gonzaga, afterward cardinal, who had established a literary academy there, of which Tasso became a member. It was during this second residence at Padua that he conceived the first idea of his great work, the *Gerusalemme Liberata*, a heroic record of the conquest of Jerusalem by the crusaders under the command of Godfrey de Bouillon. Lamartine beautifully describes the mingled motives of the poet: “Urged by piety no less than by the muse, Tasso dreamed of a crusade of poetic genius, aspiring to equal by the glory and the sanctity of his songs, the crusaders of the lance he was about to celebrate.” The same critic goes on to observe, in allusion to the less noble passion for the applause of courts that marked the poet: “The names of all the noble and sovereign families of the west would be revived in this epic catalogue of their exploits, and would attract to the author the recognition and favor of the great. . . . Finally, the poet was himself a knight, noble blood flowed in his veins, to celebrate warlike deeds seemed, as it were, to be associating his name with those of the heroes who had performed them on the field of battle: thus religion, chivalry, poetry, the glory of heaven and earth, the hope of eternal fame, all combined to urge him to the undertaking.” Bernardo heard of his son’s design with exulting joy, and blessed heaven for making Torquato a greater genius than himself. Meanwhile (1565), Tasso had been introduced by cardinal Luigi d’Este (to whom he had dedicated the *Rinaldo*) to his brother, Alfonso II., sovereign duke of Ferrara. Here for a time he was supremely happy. Young, handsome, courteous, and with that proper tinge of melancholy in his disposition that possesses an irresistible charm for women, he soon became a universal favorite with the beauties of the court. While their bright eyes rained influence, Tasso painted his *Armida* and *Herminia* almost without effort. It is only just to add that the attempt to seek the origin of his subsequent miseries and madness in a presumptuous passion for Leonora, sister of the duke of Este, which was first encouraged, then repulsed, and finally punished with imprisonment, is utterly at variance with the notorious facts of the case. Space does not permit us to examine the question here, but it appears necessary to correct errors of traditions so specious as to have imposed upon illustrious men. Tasso courted, platonically and otherwise, various ladies of the court—a pretty chambermaid even was not beneath his notice; but there is not a vestige of evidence to show that he lifted his eyes to the sister of his sovereign, or that such a suspicion was ever harbored by the lady herself or her brother. In truth, his madness was connected in its origin more closely with his poetry than with his loves. Having finished his great epic about 1575, he sent a copy of it to a society of scholars, critics, and churchmen at Rome, to get their opinion of it. It would have been far better had he published the poem at once, without placing it at the mercy of critics who were delighted to have the opportunity of finding fault before the public was in a position to praise. The critics would then have been forced to swell the chorus of general admiration. Tasso was tortured by their waspish comments, and, with pitiable agonies, proceeded to make his work more agreeable to his incapable judges. Gradually a morbid melancholy overpowered his reason; the spites and jealousies that are never absent from a gay and pleasure-loving court contributed to increase his mental disorder. He believed that invisible persecutors had denounced him to the inquisition as a heretic. It was in vain that Alfonso and his sisters tried to calm the perturbations of his spirit, and even got the inquisition to write him a reassuring epistle. His paroxysms increased in violence. Finally one evening (June 17, 1577), he drew his dagger in the apartments of the duchess of Urbino, to stab a domestic whom he conceived to be one of his secret enemies; whereupon Alfonso had him conveyed to a prison-hospital for the benefit of his health, rather than to punish him. On July 20 he made his escape, and fled across the Abruzzi to his birthplace, Sorrento, where he took refuge with his sister. The air of his native place quickly restored him to health; but no sooner had he recovered than he began to yearn for the old excitements, begged Alfonso to take him back, and when that prince drily informed him that he might return if he pleased, Tasso greedily availed himself of the cold permission, and was soon as wretched as before. A new flight ensued, this time toward the north of Italy. The unhappy poet wandered at last half-naked into the city of Turin, where he was humanely received by the marquis d’Este, brother of Alfonso. After some time, he again ventured to return to Ferrara, Feb. 21, 1579, but only to madden, almost as soon as he breathed its noxious air. Alfonso was again obliged to put him under constraint, in which he remained upward of seven years, when the duke, at the request of several of his brother sovereigns, released him (July 5, 1586). During the remainder of his life Tasso lived chiefly at Naples. Almost the last incident of his career was his visit to Rome to receive (like Petrarch) the honor of a public coronation on the Capitol. The excitement was too much for his ruined frame. A slow fever seized him; he was removed to the convent of Santo Onofrio, on the Janiculum, and there died, April 25, 1595, after a brief illness. See Manso, *Vita di T. Tasso* (Nap. 1619); Jacobi, *Vindicia T. Tasse* (Gott. 1763); Serassi, *Vita del Tasso* (Rome, 1785); Black, *Life of T. Tasso* (Edinb. 1810); Ebert, *T. Tasso's Leben* (Leip. 1819); Zuccala, *Della Vita di Tasso* (Mil. 1819); Milman, *Life of T. Tasso* (Lond. 1850); Cibrario, *Degli Amori e Della Prigione di Tasso* (Tur. 1862).

Besides his *Gerusalemme Liberata*, Tasso wrote a great number of works in verse and prose, among which may be mentioned *Rime, insieme con altri Componimenti* (Ven. 1581); *Dialoghi e Discorsi* (Ven. 1586-87); *Lettere Familiari* (Bergamo, 1588); *Rime* (Brescia, 1592-93); and *Gerusalemme Conquistata* (Rome, 1593). The most complete edition of his works appeared at Pisa (1821-32), in 33 vols.

TASTE, ORGAN AND SENSE OF. The principal seat of the sense of taste is the mucous membrane of the tongue, in which dissection reveals a *cutis* or *chorion*, a *papillary structure*, and an *epithelium*. Of the *cutis*, it is sufficient to remark that it is tough, but thinner and less dense than in most parts of the cutaneous surface, and that it receives the insertions of the intrinsic muscles of the tongue, which will be described when we treat of that organ generally. The *papillary structure* differs from that of the skin in not being concealed under the epithelium, but in projecting from the surface like the villi of the digestive canal, and it thus gives to the tongue its well-known roughness. The *epithelium* (q.v.) is of the scaly variety, as on the skin, but is much thinner on the tongue than on the skin. It is most dense about the middle of the upper surface of the tongue, and it is here that, in disordered digestion, there is the chief accumulation of *fur*, which in reality is simply a depraved and over-abundant formation of epithelium. The *papilla* on the surface of the tongue are either *simple* or *compound*. The former, which closely resemble those of the skin, are scattered over the whole surface of the tongue in parts where the others do not exist, and they likewise participate in the formation of the compound papillae, which, from their forms, are respectively termed (1) the *circumvallate* or *calyciform*, (2) the *fungiform*, and (3) the *conical* or *filiform*.

The *circumvallate* papillae are not more than eight or ten in number, and are situated in the form of a V at the base of the tongue. Their function seems to be to secrete mucus, as well as to take part in the act of tasting. They consist of "a central flattened projection of the mucous membrane of a circular figure, and from $\frac{1}{10}$ to $\frac{1}{12}$ of an inch wide, surrounded by a tumid ring of about the same elevation."—Todd and Bowman, *Physiological Anatomy and Physiology of Man*, 2d ed. vol. i. p. 437. The *fungiform* papillae are scattered over the surface in front of the circumvallate papillae, and about the sides and apex. They are usually narrower at the base than at the apex, where they are about $\frac{1}{10}$ of an inch in diameter. They are covered with simple or secondary papillae, and their investing epithelium is so thin that the blood circulating in them gives them a red color, which is not seen in the conical papillae, among which they are distributed. They contain nerves terminating in loops. The shape of the *conical* or *filiform* papillae is indicated by their names; and even if they take little part in the sense of taste directly, it is convenient to describe them here. Their average length is about $\frac{1}{10}$ of an inch. The papillae terminate in long pointed processes, which are bathed by the mucus of the mouth, and are capable of moving in any direction, although they are generally inclined backward. Some of the stiffer of these epithelial processes inclose minute hairs. Messrs. Todd and Bowman surmise, on structural grounds, that the filiform papillae "can scarcely share in the reception of impressions which depend on the contact of the sapid material with the papillary tissue. The comparative thickness of their protective covering, the stiffness and brush-like arrangement of their filamentary productions, their greater development in that portion of the dorsum of the tongue which is chiefly employed in the movements of mastication, all evince the subservience of these papillae to the latter function rather than to that of taste; and it is evident that their isolation and partial mobility on one another must render the delicate touch with which they are endowed more available in directing the muscular actions of the organs. The almost manual dexterity of the tongue in dealing with minute particles of food is probably provided for, as far as sensibility conduces to it, in the structure and arrangement of these papillae."—*Phys. Anat. and Phys. of Man*, vol. i. p. 441. Notwithstanding the difference in their outward form and mode of arrangement, the simple papillae, which have been detected by Todd and Bowman as scattered over the whole dorsum of the tongue (although concealed under the common sheet of epithelium), and those clothing the circumvallate and fungiform papillae, do not seem to present any structural difference; and their epithelium, which is very thin, readily permits the transudation of sapid substances dissolved in the mucus of the mouth. With regard to the use of the singular configuration of the circumvallate and fungiform papillae, "it may be conjectured that the fissures and recesses about their bases are designed to arrest on their passage small portions of the fluids in which the sapid materials are dissolved, and thus to derain them in contact with the most sensitive parts of the gustatory membrane."—*Op. cit.* p. 441.

There has been much discussion regarding the precise seat of the sense of taste and the true nerves of taste. Although the surface of the tongue is the special seat of gustative sensibility in man, the sense of taste is by no means restricted to that organ, being diffused, in a less degree, over the soft palate, the arches of the palate, and the fauces. Moreover, the gustative sensibility varies on different parts of the surface of the tongue. It is generally allowed that acute taste "resides at the base of the tongue, over a region of which the circumvallate papillae may be taken as the center, and also on the sides near the base. These parts are supplied solely by the glossal twigs of the glosso-pharyngeal nerves. Some writers, among whom are Valentine and Wagner, believe the mid

dle and anterior parts of the dorsum of the tongue to be usually incapable of appreciating flavor; while numerous others hold the contrary opinion, with which our own careful and repeated experiments, on other persons as well as ourselves, quite accord. Sour, sweet, and bitter substances applied to the sides, and especially to the tip of the protruded tongue, we find to be at once distinguished; though, when placed on the middle of the dorsal region, they make little or no impression till pressed against the roof of the mouth. This region of the tongue is supplied almost solely by the lingual branch of the fifth nerve. We conclude generally, with regard to the tongue, that the whole dorsal surface possesses taste, but especially the circumferential parts, viz., the base, sides, and apex."—*Op. cit.*, pp. 442, 443. The investigations of Messrs. Todd and Bowman further show that the soft palate and its arches are endowed with taste in some persons, but not universally, while they got no evidence in any case of gustative sensibility on the pharynx, gums, or elsewhere. The soft palate and its arches are supplied by palatine branches from Meckel's ganglion, and sparingly by the glosso-pharyngeal nerves. From (1) the evidence afforded by the anatomical distribution of the nerves to parts enjoying the sense of taste, (2) the evidence of experiments, in which the various nerves of the tongue were divided, and (3) the evidence afforded by disease, it may be safely inferred that the glosso-pharyngeal and the lingual branches of the fifth pair of nerves respectively participate in the sense of taste; and there is also reason to attribute a share to the palatine branches of the fifth.

Impressions of taste may be produced by a mechanical or chemical excitement of the gustatory nerves. A quick light tap of the finger on the tip of the tongue causes a taste, sometimes acid, sometimes saline, which lasts for several seconds; and galvanism acts similarly. If the surface of the tongue, near the root, be touched with a clean dry glass rod, or a drop of distilled water be placed upon it, a slightly bitterish sensation is produced; and if the pressure be continued, a feeling of nausea ensues. If a small current of cold air be directed against the tongue, it excites a cool saline taste like that of saltpeter. From the experiments of E. H. Weber, it appears that one of the conditions requisite for the due exercise of the sense of taste is a temperature not departing far on either side from the natural standard. Thus, if the tongue be immersed for a minute in water at a temperature of 125°, or in ice water, the taste of sugar, etc., is no longer perceived. In order that sapid bodies should cause taste, it is necessary that they should be dissolved, and made to permeate the tissue of the papillæ, so as to come in contact with their nerves. This is proved by the two following facts: 1, that every substance, whether solid, fluid, or gaseous, which possesses a distinct taste, is more or less soluble in the fluids of the mouth, while substances which are perfectly insoluble are only recognized by the sense of touch; and 2, that if the most sapid substance be applied in a dry state to a dried part of the surface of the tongue, no sensation of taste is excited. Bitters and acids appear to be the most sapid bodies, since they may be diluted to a greater extent than any other known substances without ceasing to excite sensations of taste. Thus, according to Valentin, 1 part of extract of aloes, or of sulphuric acid, in 900,000 of water, and even 1 part of sulphate of quinia in 1,000,000 parts of water, may, with ease, be distinguished from perfectly pure water. "The contact of a sapid substance," says Dr. Carpenter, "much more readily excites a gustative sensation when it is made to press upon the papillæ, or is moved over them. Thus there are some substances whose taste is not perceived when they are simply applied to the central part of the dorsum of the tongue, but of whose presence we are at once cognizant by pressing the tongue against the roof of the mouth. The full flavor of a sapid substance, again, is more readily perceived when it is rubbed on any part of the tongue, than when it is simply brought in contact with it, or pressed against it. Even when liquids are received into the mouth, their taste is most completely discriminated by causing them to move over the gustative surface: thus, the "wine-taster" takes a small quantity of the liquor in his mouth, carries it rapidly over every part of its lining membrane, and then ejects it."—*Principles of Human Physiology*, 6th ed. p. 621. Most sapid substances affect the nerves of smell to a greater or less degree, as they pass down the throat; and it is this compound of taste and smell that constitutes *flavor*. It is a common habit to hold a child's nose when he is taking a nauseous draught, with the view, as is supposed, of deadening the taste. The efficacy of the process depends upon the exclusion of smell, and the reduction of the flavor of the medicine to its mere taste. The agreeable sensation produced by sipping good wine is due to what is termed its *bouquet*, or in other words, to its flavor, or combined taste and smell. Some substances leave a taste in the mouth very different from that which they first produced. This *after-taste* is usually bitter; but in the case of one of the most bitter substances known, namely, tannin, it is sweet. This connection seems, in a degree, to correspond to the complementary colors in vision.

There can be no doubt that the sense of taste has for its primary object to direct us in the choice of food, to make the act of eating agreeable, and to excite the flow of mucus and saliva which aid the digestive process; and among the lower animals, the instinctive perceptions connected with this taste are much more remarkable than in man. As a general rule, it is found that those substances whose taste is agreeable are useful articles of food, and *vice versa*; although there are some well-known exceptional cases.

Sir Henry Holland, in his *Medical Notes and Reflections*, observes that in the majority of instances of actual illness, the desires of the patient as to food and drink may be safely complied with, even when some seeming extravagance of diet is suggested; and that in the early stage of recovery from gastric fevers, he has seen many curious instances of such contrariety to all rule acquiesced in with manifest good to the patient. "Dietetics," he adds, "must become a much more exact branch of knowledge, before we can be justified in opposing its maxims to the natural and repeated suggestions of the stomach, in the state either of health or disease."

TATE, a co. in n.w. Mississippi; watered by Coldwater river, traversed by the Chicago, St. Louis and New Orleans railroads; about 400 sq.m.; pop. '80, 18,721—9,632 colored. The surface is mostly level. The soil is fertile. The principal productions are corn, wheat, cotton, and potatoes. Co. seat. Senatobia.

TATE, NAHUM, a poet and dramatist, son of the rev. Dr. Faithful Tate, was b. in Dublin in 1652, and educated at Trinity college, Dublin. In 1690, he succeeded Shadwell as poet-laureate, and held that dignity till his death in 1715. His habits were somewhat improvident, and in the latter part of his life resided within the precincts of the mint at Southwark, then a privileged sanctuary for debtors—hence perhaps that "downcast look" and inability to "say much for himself," for which, it is said, he was remarkable. His writings include nine or ten dramatic pieces, *Panacea*, or *a Poem on Tea*, various birthday odes, and an elegy on the death of queen Mary. He lived to write the first birthday ode for George I. But Tate is best known by the metrical version of the Psalms, which he executed in conjunction with Dr. Nicholas Brady, chaplain to king William and queen Mary, which was attached to the prayer-book, and came into general use in the church of England, supplanting the older version made in the reign of Edward VI. by Sternhold and Hopkins.

TATHAM, WILLIAM, 1752-1819; b. England; emigrated to America in 1769 and engaged in business in Virginia. He served in the revolutionary war, was admitted to the bar in 1784, and two years later settled in Lumbarton, N. C., which he represented in the legislature in 1787. He was superintendent of the London docks, 1801-5, when he returned to this country. In 1817 he became a United States military storekeeper. Having lost his property he committed suicide on Washington's birthday by throwing himself before a cannon.

TATIAN, one of the early apologists of Christianity against the pagan philosophers, and the founder of a sect which, whether under his own name, or under various other appellations derived from its peculiar tenets or practices, attracted considerable notice in the primitive ages. Tatian was b. in Syria or Assyria about the year 130. Having cultivated rhetoric and philosophy in various places, he came to Rome about 162, where he became the disciple and friend of Justin the martyr, and was by him converted to Christianity. He is known to have written many works—*infinita volumina*, says Jerome—of which, however, only one is preserved, the Apology already referred to. The date of its composition is uncertain, but it seems probable that it was written before the death of Justin (166 A.D.). No trace appears in the Apology of the heterodox opinions of Tatian, and it is alleged by Tertullian (*Adv. Her.* i. 28, 1) that it was not till after the death of Justin that he fell into the errors to which he has given a name. He then removed to the East, and is said to have established himself in Mesopotamia. Without entering into the details of Tatian's peculiar opinions, it will be enough to say that, especially in their moral aspect, they formed the foundation of one of the great divisions of Gnosticism (q.v.). Starting from the common principle of dualism, and of the origin of matter from the evil principle, and its consequent evil nature, Tatian, unlike the Egyptian Gnostics, held the necessity of overcoming the corrupt nature of man, and purifying it by abstinence and ascetic rigor. Accordingly, he reprobated marriage, and condemned all sensual indulgence. One of his "opinions," affirming the damnation of Adam, was peculiarly odious to the orthodox party. He condemned the use of wine so strongly as to forbid it even in the celebration of the Eucharist, in which his followers permitted only water to be used, whence they received the name of *Hydroparastatæi* (from *hydor*, water, and *paristemi*, I present), and in Latin *Aquarii*. From their generally rigorous asceticism, they were called *Encratites* (from *engkratein*, to keep continent). In their dogmatic views as to Docetism, the Demiurge, and Emanations, they differed little from other Gnostics of the Syrian school. See GNOSTICS, MANICHEANS, MYSTICISM.

TATIUS, ACHILLES, one of the later Alexandrine authors, of whose life absolutely nothing is known. He was formerly thought to have flourished during the 2d or 3d c. A.D.; but as he undoubtedly imitated the style of Heliodorus of Emesa, he cannot be placed earlier than the beginning of the 6th c. (see NOVELS). Suidas, who calls him Achilles Statius, says that he was originally a pagan, but that he was afterward converted to Christianity, and rose to be a bishop. If this be true, the romance which has preserved the author's name, *To Kata Leukippen kai Kleitophon'a* (The Loves of Leucippe and Cleitophon), must have been composed before his conversion, for it is in parts too licentious and too heathenish to be the work of a Christian, and more espe-

cially of a convert. The first edition of the Greek original appeared at Heidelberg in 1601; another with a copious commentary, was published by Salmasius in 1640; but the best is that by Fr. Jakobs (Leip. 2 vols., 1821).

TATNALL, a co. in s.e. Georgia; drained by the Great Ohoopce, the Cannouchee, and the Altamaha rivers, the last two being its n.e. and s. limits; about 1200 sq.m; pop. '80, 6,985—6,969 of American birth; 1974 colored. The surface is level; the soil sandy and unproductive; cotton, corn, sweet potatoes, and rice are the staples. Co. seat, Reidsville.

TATNALL, JOSIAH, 1762-1803; b. Georgia; joined the army of gen. Wayne, 1780; appointed col., 1793; brig.gen., 1800; was prominent in military affairs; often a member of the legislature; U. S. senator, 1796-99; governor of the state, 1801-2.

TATTA (more correctly, **THATTA**), a t. of Sind, on the right bank of the Indus, and at the head of the delta of that river, 64 m. e. of Kurrachi. In former times, Tatta was a most flourishing town, and manufactured fabrics of silk and cotton—a branch of industry that has almost wholly disappeared. The only noticeable structure is the mosque of Shah-Jehan, built of brick, which is now falling into decay; but the vast cemetery of Tatta deserves mention. It has an area of 6 sq.m., contains, it is calculated, at least a million tombs, and has room for not less than four millions. Pop. of Tatta, about 10,000.

TATTAM, HENRY, D.D., LL.D., 1788-1868; b. Ireland; educated at Trinity college, Dublin, and at Göttingen and Leyden; ordained in the church of England; rector of St. Cuthbert's, Bedford, 1818-45; archdeacon of Bedford, 1845; rector of Stamford Rivers, Essex, 1849. He traveled in the east, and became distinguished as an orientalist, in which department he published various works. Among the ancient Syriac MSS. which he found at a convent in Egypt were the *Ecclesiastical History* of John bishop of Ephesus, and *Epistles of Ignatius*.

TATTLER. See **SANDPIPER**, *ante*.

TATT00, in military life, is the beat of drum and bugle-call sounded at sunset to draw in all stragglers and others on detached duty.

TATTOOING, a custom extensively prevalent among savage nations, of marking the skin with figures of various kinds, by means of slight incisions or punctures and a coloring matter. The term is of Polynesian origin, and is said to be derived from a verb *ta*, which signifies to strike. Tattooing is almost universal in the South Sea islands, except where Christianity and civilization have put an end to it. New Zealanders' heads, exhibiting tattooing, are among the curiosities to be seen in museums; and at one time it was very common for the masters of vessels visiting New Zealand to purchase them and bring them home, although there is too much reason to believe that the price paid for them stimulated the feuds of the natives. The tattooing of the New Zealanders and other South Sea Islanders often covers the whole face, and sometimes also the chest, arms, and other parts of the body with elaborate patterns. It is performed in youth, and marks the transition from boyhood to manhood, like the assumption of the *toga virilis* among the ancient Romans. The operation is accompanied with superstitious ceremonies, and is attended with considerable pain, which, of course, is to be endured with manly indifference. An instrument of bone, toothed on the edge, is employed, which is applied to the skin, and struck with a piece of wood, having first been dipped in a thick mixture made by rubbing down charcoal with a little water. The marks which result are permanent, and appear black on a brown skin; although they are dark blue on the skin of a European. Tattooing is, or has been, practiced in almost all parts of the world. It seems to be one of the practices prohibited to the Jews, in Lev. xix. 28, "Ye shall not make any cuttings in your flesh for the dead, *nor print any marks upon you*," from which may be inferred its prevalence among the surrounding tribes in the days of Moses, and its connection with their superstitions. The Bedouin Arabs, the Tunguses, and other eastern tribes, and many tribes of American Indians, practice it at the present day. Among the Bedouins, it is a favorite mode of female adornment. It prevailed among the ancient Thracians, and was distinctive of high rank. The ancient Britons also practiced it, and traces of it appear to have lingered in England till after the Norman conquest. Perhaps the practice of sailors to print anchors and other marks on their arms, may be regarded as a relic of it still subsisting.

TAU, Cross, in heraldry, a cross of a form somewhat resembling the Greek letter *tau*. St. Anthony is generally represented with a cross of this description, embroidered on the left side of his garment.

TAUCHNITZ, KARL CHRISTOPH TRAU, a famous German printer and bookseller, was b. at Grossspardau, near Leipsic, in 1761. Bred a printer, he began, in 1796, a small printing business of his own in Leipsic, with which he shortly after conjoined publishing and type founding, and which, in process of time, became one of the greatest establishments of the kind in Germany. In 1809 he began the issue of a series of editions of the classic authors, the elegance and cheapness of which gave them a European

circulation. By offering a prize of a ducat for every error pointed out he was able to bring out, in 1828, an edition of Homer of extraordinary correctness. He was the first to introduce (1816) stereotyping into Germany; and he also applied it to music, which had not been attempted before. In the latter years of his busy life, he stereotyped the Hebrew Bible, and the Koran in the original Arabic. On his death, in 1836, the business was continued by his son, KARL CHRISTIAN PHIL. TAUCHNITZ.—A nephew of the elder Tauchnitz, CHRISTIAN BERNH. TAUCHNITZ, also set up a publishing establishment in Leipzig, combined with printing. Among the most noted of his undertakings is the well-known issue of "British Authors" (begun 1842), of which upward of 1200 vols. have appeared. Ennobled in 1860, Tauchnitz was made one of the few Saxon liepeers in 1877.

TAULER, JOHN, a remarkable mystic and preacher, was b. at Strasburg in 1290, and died there June 16, 1361. About the year 1308, renouncing a considerable fortune, he entered into the mendicant order of Dominicans, and afterward studied theology in Paris, showing at that early period a predilection for speculative and mystic writings, as the scholastic philosophy and the prevailing theology of the schools did not satisfy him. Notwithstanding this tendency, his predominating practical turn of mind led him, on his return to Strasburg, to preaching and pastoral duty; and this he continued to practice with zeal and undaunted courage, even when, in consequence of the excommunication which the pope had hurled against the emperor Ludwig, the country had fallen into a state of dreadful distraction, and almost all the clergy, in obedience to the interdict issued by the bishop of Strasburg, had suspended worship. Although Tauler was now 50 years old, and had enjoyed celebrity for several years as a preacher, so powerfully was he influenced by a Waldensian of the name of Nicholas von Basel, who paid him a visit in 1340, that he gave himself up for two years to ascetic exercises and devout contemplation. Afterward, however, he betook himself more decidedly to vigorous exertions on behalf of the despised and oppressed people, and preached with wonderful power, inveighing against the avarice, ostentation, and hard-heartedness of the laity as well as of the clergy; and, although not departing from the doctrines of the church, yet fearlessly exposing its abuses, and even not sparing the pope. Thus it happened, that although he had indefatigably administered the consolations of religion in the midst of the horrors and desolation of the black death (q.v.), the bishop interdicted him from preaching, and he was obliged to quit his native town. He repaired to Cologne; but nothing further is known, either of his residence there or of his return to Strasburg, where, after a life full of toil, denial of self, and beneficence to others, he died, an old man of 70 years, and was buried in his cloister. If not the greatest German preacher of the middle ages as a whole, Tauler certainly was the greatest of his times. As his mysticism was in noway passive, but aimed at rising above the sad condition of his times and the failings of the church by inward piety and a love self-denyng but at the same time active; so his style, both in his preaching and in his devotional work, was lively, impressive, picturesque, and had altogether a practical direction. Among his devotional works, the *Nachfolge des armen Lebens Christi* holds the first place. Whether the sacred hymns which bear his name really belong to him, is doubtful. Of his writings and sermons, in which he always used the German language, many have been preserved in MS.; and since 1498, numerous editions have been published, but untrustworthy, and often translated into the dialect of the place where they happened to be printed. A careful translation into new High-German has been published by Schlosser (*Predigten*, 3 vols. Frank. 1826; *Nachfolgung des armen Lebens Christi* (Frank. 1833); Schmidt, *Johannes Tauler von Strasburg* (Hamb. 1841); and Susannah Winkworth, *Life and Times of Tauler*, with 25 of his sermons translated from the German (Lond. and New York, 1857).

TAUNTON, a flourishing city of Bristol co., Mass., on Taunton river, 35 m. s. of Boston, and 30 m. e.n.e. of Providence. The falls of Taunton river and its branches furnish water-power to numerous factories, among which are 6 cotton-mills, 7 for machinery, 2 for locomotives, 6 foundries, 2 tacks and brads, copper and zinc, 2 britannia ware; iron, metallic gas-pipes, enameled cloth, screws, files, arms, crucibles, fire-brick, etc. In copper manufacture, a capital of about £180,000 is invested: in making iron, which is the chief manufacture, about £400,000. Pop. '75, 20,429. Seven railways pass through Taunton, and it has also a considerable coasting-trade, and important fisheries of shad, herrings, and alewives. There are 19 churches, 60 schools, a state hospital for the insane with 400 patients, academy, court-house, 1 daily and three weekly newspapers, 3 banks, etc. Taunton was settled from Taunton in England in 1638. Its first minister was William Hooke, afterward a chaplain of Cromwell.

TAUNTON, *Tone-ton*, so named from being built on the banks of the river Tone, is situated in the extensive and beautiful valley of Taunton Dean, or vale of Taunton, in the county of Somerset, 44 m. s.w. of Bristol by railway. It communicates by railway with the Bristol and English channels. The streets are wide, well-paved, and lighted: the shops are modern and capacious, but the woolen and silk factories which were once extensive here have almost wholly departed. Assizes are held here twice yearly. Taunton is the headquarters of the Somerset archeological and natural history society, in connection with which there is an extensive museum, placed in the ruins of the Norman castle—rich especially in fossils from the Devonian strata, and the bones of mam-

malia of the cave period from Mendip and the Somersetshire gravels—and a well conducted reading-room. There is a collegiate school founded by bishop Fox, 1522, two dissenting colleges, several other good schools, and many charitable and other institutions. Taunton, which is a parliamentary borough, returns two members to the house of commons. Pop. '71, 15,466. Ina, king of the West-Saxons, built a castle in Taunton about 700 A.D. This was soon after destroyed, but another fortress was built on the site soon after the conquest, at which period the town had a mint. In 1127, Giffard, bishop of Winchester, built and endowed a priory for the canons of St. Augustine; and in 1322 we find a house of Carmelite friars. The church of St. Mary is a magnificent specimen of perpendicular architecture, and is famous for its graceful and delicately ornamented tower. That of St. James was the conventual church of Taunton priory. The shire hall and the literary institution are handsome modern buildings. To Taunton castle, Perkin Warbeck fled when he failed in storming Exeter. During the civil wars between Charles and the parliament, the town was twice besieged by Goring and twice successfully defended by col. Blake. In Taunton, Monmouth received the heartiest welcome, and judge Jeffreys exercised his unbounded cruelty.

TAUNUS MOUNTAINS. See NASSAU.

TAURIDA, a government of South Russia, bounded on the e. s., and s. w. by the sea of Azov and the Black sea. Area, 24,140 sq. m.; pop. 653,549, mostly Nogai Tartars. The peninsula of the Crimea (q. v.) forms the southern portion of the government, and is connected with the northern portion by the isthmus of Perekop (q. v.) The region n. of the isthmus is flat; the Crimea contains mountain-ranges which rise upward of 5,000 feet. The only great river is the Dnieper, which forms the n. w. boundary; and the other principal streams are the Salgir and Alma in the Crimea. Among the salt lakes of the Crimea, which are very productive in salt, the lake of Sakky is celebrated for the efficacy of its waters in certain cases of disease. The climate is temperate and warm on the southern shores of the Crimea. The soil is fertile, but cultivation is carried on on a very limited scale. In the north the pasturage is very rich, and cattle-breeding is the main employment of the inhabitants. In the south the mountains are clad with forests, the tobacco-plant is successfully cultivated, and fruit-growing and wine-culture are the principal occupations. The Crimean wines, the *bouquet* of which resembles that of Burgundy and the Rhenish wines, are of a very good quality. The native riches of the government, its excellent ports and harbors, promise great commercial progress. Simferopol (q. v.) in the Crimea, is the capital of the government, and Sevastopol (q. v.) and Theodosia are ports of rapidly increasing importance.

TAURINE, $C_{12}H_{17}NO_6S_2$, is a very remarkable substance occurring in the bile and in other animal products and tissues. In a state of purity it forms six-sided glis-tening prisms, which are perfectly transparent, neutral, devoid of odor, readily soluble in hot water, but difficult of solution in cold water, and insoluble in alcohol and ether. It does not enter into combination either with acids or bases. When heated, it undergoes decomposition, and evolves sulphurous acid, in consequence of the sulphur (upward of 25 per cent) which it contains. Taurine occurs naturally in the bile of many animals, including man. As a product of the decomposition of the bile, it may be found in the contents of the intestine and in the excrements; and in cases of jaundice it has been found in the blood, transudations, and urine. Its artificial formation has been noticed in the article **SYNTHESIS**. Its name is derived from the latin *taurus*, a bull, because taurine was first discovered in the bile of the ox.

TAUROMENIUM. See TAORMINA, *ante*.

TAURUS, MOUNT. See ANATOLIA.

TAUSIG, KARL, 1841–71; b. Warsaw; studied music under Liszt, and made a great reputation as a pianist and orchestral director. He was made court pianist at Berlin in 1865. He had an unusual musical memory, and played nearly all the chief compositions of the great masters without notes.

TAUTOG or BLACKFISH. *Tautoga nigra* or *Americana*, a fish of the family *labridæ* (q. v.), of the section forming the family *cyelo-labridæ* of Müller. It is found in the North American seas, and is in great request for the table. It brings a very high price in the New York market. It attains a size of 12 or 14 lbs. Its color is black on the back and sides; the belly is whitish; both jaws have a double row of strong conical teeth; the face is covered with a scaleless integument. The tautog is caught by hook and line on rocky bottoms. It is sometimes kept in stews to fatten.

TAUTOLOGY (Gr. *tauto*, the same, and *logia*, speech) is a term used to denote the useless repetition of the same ideas in different words. It is considered one of the worst vices, whether of oral or written style, and certainly none more effectually robs language of its force and impressiveness.

TAVERN, a place of entertainment for man and beast, is not a legal term. See **INN**, **PUBLIC-HOUSES**.

TAVERNIER, JEAN BAPTISTE, BARON D'AUBONNE, a celebrated French traveler, was the son of a Flemish engraver who had settled in Paris, and was born there in 1605. The conversation of the savans who frequented his father's shop inspired him with a

ardent curiosity to visit other countries, and prompted him to leave the parental roof before his 15th year. After visiting England, the Low Countries, Germany, Hungary, and Italy, he eagerly caught at the offer made to him by father Joseph (the confidant of Richelieu), to accompany two French noblemen to the east. This journey lasted from Dec., 1630 to the summer of 1633, the line of route passing through Regensburg, Dresden, Vienna, Constantinople (where he left his masters), Erzeroum, Tabriz, Ispahan, Bagdad, Aleppo, and Scanderoon, and thence by sea to Rome. Tavernier then obtained an important post in the household of the duke of Orleans, but received occasional leaves of absence to prosecute his journeys in the east. The *second journey* (1638-43) was from Marseilles to Scanderoon, thence across Syria to Ispahan, south-western Persia, and Hindustan; the *third* (1643-49, through Ispahan, much of Hindustan, Batavia, and others of the East Indies; and in the *fourth* (1651-55), *fifth* (1656-?), and *sixth* (1663-69), various portions of Persia and Hindustan were visited, the outward route being generally by way of Syria and the Arabian desert, and the return one by Asia Minor. Tavernier invariably traveled as a dealer in precious stones and other valuable articles of small bulk, and the great profits he realized strongly impressed upon him the advantages of regular commerce between Europe and the east. On his return to France in 1669 he was graciously received at court by Louis XIV., who presented him with "letters of nobility" in reward for his services to French commerce in India. But his prodigal expenditure and careless generosity speedily reduced his fortune, and the revocation of the edict of Nantes compelled him to take refuge in Switzerland, whence he removed to Berlin, and became director of an East India company which was projected by the elector of Brandenburg. With the view of discovering a road to the Indies through Russia, he set out from Berlin in 1688, but died at Moscow in July, 1689. An account of his travels was written for him by various parties (for Tavernier had no literary qualifications,) and though full of matter valuable to the historian and geographer, it is so ill-arranged as to be in many cases almost unavailable. Tavernier was one of the most remarkable of travelers; wholly devoid of classic sentiment, he traversed the plains of Troy, and passed the ruins of Persepolis without even a flutter of interest, and partly owing to this remarkable condition of mind, his statements are distinguished by an accurate truthfulness little common among travelers. But the chief value of his book lies in the fullness and accuracy with which the nature and state of oriental commerce, the chief markets and commercial routes, and the various systems of coinage and their relations are detailed. Some of his statements concerning the conduct of the Dutch in the East Indies called forth a most virulent and abusive reply from Jurieu, the Protestant theologian, in his *L'Esprit de M. Arnauld* (1684), and a more moderate one from Van Quellenburgh; but all Tavernier's assertions which were of any moment were found to be perfectly correct. His travels were originally published in 3 vols. (two in 1676-77, and the third in 1679); they have since been several times republished, last in 1810, in 7 vols.; and have been translated into English (1678, 1684, 2 vols.), Dutch (1682), and German (1684).

TAVIRA, a sea-port t. of Portugal, province of Algarve, 20 m. n.e. of Faros, pleasantly situated at the mouth of the Sequa. Tavira has decayed considerably since 1654, when, it is said, 40,000 people in the town and environs fell victims to the plague. Pop. about 11,000.

TAVISTOCK, a parliamentary borough and market-town of Devonshire, picturesquely situated on the western border of Dartmoor, about 35 m. s.w. of Exeter, in the fertile valley, and on the right bank, of the Tavy (whence its name), which is here crossed by two bridges within the town. Tavistock is a thriving town, with some small manufactures of serges and woolen cloths, iron-foundries and mining-works, copper, lead, tin, and iron being found in considerable quantity in the neighborhood; but the population is chiefly agricultural. It is a place of considerable antiquity, and was formerly of great importance, owing mainly to its abbey, the largest and most magnificent in Devonshire, which was founded in the year 961 for the Benedictine order, by Ordgar, earl of Devonshire, father of the infamous Elfrida, and endowed with many privileges, the abbot being a peer of parliament. At the dissolution, when the revenue amounted to upward of £900, it was bestowed upon John, lord Russell, in possession of whose descendant, the duke of Bedford, the property still remains. A printing-press, the second set up in England, was established in the abbey at a very early period. The refectory and abbey gateway still exist in good preservation. The parish church is a handsome edifice, with a tower at the w. end, resting on arches, under which there is a thoroughfare. The borough sends one member to the house of commons. At the breaking out of the civil war Pym was member for Tavistock. Tavistock is one of the four stannary towns of the co., and is governed by a port-reeve, elected annually; a co. court is held in the town. It is connected with Barnstaple, Launceston, and Plymouth by railway, and with the river Tamar by a short canal. Sir Francis Drake was born in the immediate neighborhood in 1545, and the poet W. Browne in the town in 1590. Pop. '71, of parliamentary borough, 7,725.

TAVOY, the chief t. of a district in Tenasserim, British Burmah, is situated on the left bank of the Tavoy river, about 34 m. from its mouth, in lat. 14°4' n., long. 98°5' e., at the distance of about 220 m. s. of Moulmein. The site of Tavoy, which is low, is

inclosed on three sides by rice-fields, and on the fourth by the river. The houses are scarcely visible from the river—umbrageous trees, palms, plantains, jacks, cassias, and hundreds of flowering shrubs nearly concealing them from view. A wooden-covered pier, supported on piles, forms a convenient landing-place. There is a hospital, a large jail, and a roomy *zayat*, or caravansary. The houses, according to the universal practice of the country, are raised from the ground on piles, and are made of bamboo, fastened with rattan, and thatched with the leaf of the water-palm. Under many of the houses a loom may be observed, at which a female is generally busy at work. The shops are for the most part mere sheds or stalls, and the vendors sit squatted on the raised floor in the midst of their wares. "In this little town," says a recent eye-witness, "Burman life and manners are seen in all their simplicity; and the observer cannot but be struck by the frugality, contentment, happiness, and enjoyment of life manifested by the people." Tavoy is remarkable for its grand annual buffalo-fight. The sport continues for two days, and during that time eight pairs of buffaloes are brought into the field, each animal representing a different district or township. The rice-fields around Tavoy are prolific sources of malaria. Intermittent fevers and dysentery are the most common diseases; but the climate is on the whole healthy, and is not considered inimical to the European constitution. According to the estimates of 1871-72, the population of Tavoy was 14,467. The bulk of these are true Burmans, the balance being made up with Shans and Thongthoos, Karens, Chinese, Malays, and natives of India.

Vessels drawing not more than 12 ft. of water can reach the town of Tavoy by means of the Tavoy river. The anchorage for large ships is at Goodridge plains, about 30 m. below the town.

Tavoy used to be one of the stations in which British troops were settled, but these have been lately withdrawn.

TAX SALES, a public sale of land, according to law, for non-payment of taxes assessed upon it. Some general principles may be stated, as running through the statutes of all or nearly all the states; but as the proceedings are regulated entirely by statute, the rights of the purchasers under, and of the original owners before such sales, the manner in which such sales are conducted, and the regulations in regard to laying taxes differ widely in different states. In the first place the assessed tax must be uncollected upon land unexempt. The land cannot be legally sold after payment or tender, either by the owner or any person whose interests would suffer by the sale. The statutory provisions before and during the sale must be exactly followed. The tax must have been properly assessed, the proper officer must have attempted to collect it, the sale must be public, duly advertised, take place at the advertised time and place, etc. The land is sold to the highest cash bidder, to whom a certificate is given, entitling him to a deed at the end of the statutory period, during which the owner may redeem, and after which a deed from the state is given to the purchaser. In a majority of the states at present this deed is *prima facie* evidence of the regularity of all the proceedings on the sale. At common law, and by the statutes of some states, it rests upon the purchaser to prove the regularity of such proceedings. In some states it must have been decided by the proper court that the taxes are unpaid, before a sale can take place.

TAX—TAXATION. This term, as expressing the exaction of money from the individual for the service of the state, is familiar to all mankind a step above barbarism; and yet few subjects are surrounded by a greater number of practical difficulties and theoretical niceties. These may be grouped under two sets of considerations—those which affect the justice of a tax, and those which affect its productiveness, and these two often tell on each other. Taxation, indeed, has so frequently been the means of perpetrating political injustice, that the term has fallen into bad popular repute. Whenever the produce of a tax is used otherwise than in the service of those who pay it, the tax is unjust. In its more oppressive form, it has been levied on conquered states, for the benefit of the conquerors, and in this shape it has sometimes been called tribute. The direction which all constitutional struggles to cleanse taxation from injustice have taken has been that of self-taxation, the community as a whole deciding on what it requires to take from the individual members for the public service. The accomplishment of this has been the chief object of all the struggles which have made a free constitution for the British empire. There were old feudal dues which the monarchs had the power of exacting; but when these were insufficient for their ambitious projects, they had to ask parliament for a supply, and parliament generally took the opportunity of granting it to demand redress of grievances. It came thus to be a fundamental constitutional doctrine, that no tax can be levied save by the consent of the representatives of the people who have to pay it. The constitutional doctrine thus created by Britain was remembered by the American colonies when Mr. Grenville sought to raise there a stamp-duty and a customs-duty on tea, and the colonies revolted under the celebrated cry that "taxation without representation is tyranny!"

It was discovered, in the course of the long struggle of the house of commons to keep its hold on the purse, that the least afflictive of taxes may be the most dangerous. A fixed land-tax comes, for instance, to be no impost at all, in the afflictive sense of the term. If a thousand a year have been drawn off a certain acreage of land from time immemorial, the proprietors never possessed that part of the rents, and are no more

sufferers from not having them than from not possessing their neighbors' estates. A government with a large revenue of this kind, however, will certainly be inimical to freedom. The time when the liberties of England were in the greatest danger was the twelve years of Charles I.'s reign in which he was able to get on without going to parliament for money. The extravagance of sovereigns who wasted the domains of the crown has generally prevented them from having too formidable an influence by the possession of independent incomes. In Britain, this difficulty has been effectually guarded against, and any of the expenses of the crown which can now be paid without going annually to parliament for a vote of supply are of a very trifling character.

How to make taxation productive, is a vast and complicated practical science. Turgot, one of the wisest of financiers, called it the art of plucking the goose without making it cry. The most ingenious devices to this end, however, have often, in practice, met with counteracting difficulties. It was supposed that indirect taxation—that is, a duty levied on articles before they reach the consumer, must, in a civilized and orderly country, be almost inexhaustible. The merit of the system lay in the consideration, that the burden of the tax did not fall on the person who paid it. Income-tax, house-tax, dog-tax, and the like are levied directly on the person on whom the burden ultimately falls, and if he do not pay, the amount will be taken by force. Tea-duty, sugar-duty, and wine-duty, however, are not levied on the consumer, though he has to pay them; they are levied on the importer, who has no, or a very slight, interest against the tax, since he must charge it on the consumer. But this form of taxation is met by checks. If it is excessive, people will not buy the taxed article; and it has often been found that reducing the duty increases the revenue. An indirect tax on luxuries, and especially on those which may be used to vicious excess, has strong recommendations. In some cases, it is no great calamity should the tax throw the article nearly out of use. But then comes another check in the smuggler, whose profession may probably do more to corrupt and disorganize society than the free use of the article in which he deals. A tax on the necessities of life, on bread or salt, cannot be evaded, as in the case of luxuries, by the abandonment of use, and therefore it is very productive, but it is also very oppressive. The tax on salt in France was one of the chief causes of the French revolution. The happiest condition for the revenues of a country is when luxuries are so abundantly used by all classes that a small addition to their price is a slight burden, yet yields a large revenue. In this country, the revenue thus derived from tea, sugar, and stimulants may be set down in round numbers at 30 millions. The chief taxes which now form the revenue of Britain are—1. Those by old custom called "assessed," and levied upon certain items in the possessions and enjoyments of the citizen, as his house-domestics, horses, dogs, and armorial bearings. 2. The property and income tax, which, after long disuse, was renewed in 1842, and is raised from time to time according to the exigencies of the government. 3. The customs. 4. The excise. 5. The stamps and post-office; and 6. The land tax. See CUSTOMS-DUTIES, EXCISE, POST-OFFICE, STAMPS, LAND-TAX, FINANCE.

TAX—TAXATION (*ante*). The constitution of the United States vests in the general government the right of imposing taxes upon the people so far as duties on imports or exports are concerned; also requires that all bills for raising revenue shall originate in the house of representatives. No state is permitted to lay any impost or duty on imports or exports (except what may be necessary for executing its inspection laws) without consent of congress; and the net produce of all such duties and imposts is required to be for the use of the treasury of the United States. But no tax or duty can be laid by congress on articles exported from any state; nor can any capitation or other direct tax be laid, except in proportion to the authorized census or enumeration. The systems of taxation in the United States are therefore two in number: that of the national government; and that observed by the state governments, each in its sovereign capacity. Taxation by the national government is required to be uniform throughout the country; and direct taxation from this source must be apportioned to the states in accordance with their respective population. Until the war of the rebellion the national government relied wholly on duties on imports for funds to carry on the government; but from that time it has been found necessary to add to this source of income taxation on various domestic manufactures; and during the war an income tax was imposed. The existing internal revenue taxes are placed upon the capital and circulation of banks; on beer, ale, wines, whisky, cigars, tobacco, patent medicines, cosmetics, etc.; on matches, wax-tapers, cigar-lights, etc. The table on the opposite page shows the receipts of the United States by taxation from March 4, 1789, to June 30, 1879.

State taxation is direct, and is either through poll-taxes upon individuals, or by assessment upon property. Not all the states levy poll-taxes, the plan being obnoxious to many. Taxation upon real estate is levied through assessment by duly appointed assessors, on proper estimates made by these officials. The custom is to assess real estate at from one-quarter to one-half its market value. Local taxes in counties, towns, cities, and school-districts are levied in accordance with general statutes or by special charter, and are apportioned in accordance with the state valuation, except as to improvements in cities, which are made chargeable on adjoining property. Taxation on personal property is levied on returns made by the persons or corporations in question. In the neces

YEARS.	Customs.	Internal Revenue.	Direct Tax.
1789-91.....	\$4,399,473 09	.....	.....
1792.....	3,443,070 85	\$208,942 81	.....
1793.....	4,255,306 56	337,705 70	.....
1794.....	4,801,065 28	274,089 62	.....
1795.....	5,588,461 26	337,755 36	.....
1796.....	6,567,987 94	475,289 60	.....
1797.....	7,549,649 65	575,491 45	.....
1798.....	7,106,061 93	644,357 95	.....
1799.....	6,619,449 31	779,136 41	.....
1800.....	9,080,932 73	809,396 55	\$734,223 97
1801.....	10,750,778 93	1,048,333 43	554,343 38
1802.....	12,438,235 74	621,898 89	206,505 44
1803.....	10,479,417 61	215,179 69	71,879 20
1804.....	11,098,565 33	50,941 29	50,198 44
1805.....	12,936,487 04	21,747 15	21,882 91
1806.....	14,067,698 17	20,101 45	55,763 86
1807.....	15,845,521 61	13,051 40	94,732 56
1808.....	16,363,550 58	8,190 23	19,159 21
1809.....	7,257,506 62	4,084 29	7,517 31
1810.....	8,583,309 31	7,430 63	12,448 68
1811.....	13,313,222 73	2,205 95	7,696 66
1812.....	8,958,777 53	4,903 06	859 22
1813.....	13,224,623 25	4,755 04	3,805 52
1814.....	5,998,772 08	1,662,984 82	2,219,497 36
1815.....	7,282,912 22	4,678,059 07	2,162,673 41
1816.....	36,306,874 88	5,124,708 31	4,233,635 09
1817.....	26,283,348 49	2,678,100 77	1,834,187 04
1818.....	17,176,385 00	955,270 20	264,333 26
1819.....	20,283,698 76	229,593 63	83,650 78
1820.....	15,005,612 15	106,260 53	31,586 82
1821.....	13,004,447 15	69,027 63	29,349 05
1822.....	17,589,761 94	67,065 71	20,961 56
1823.....	19,088,433 44	34,242 17	10,237 71
1824.....	17,878,325 71	34,663 37	6,201 96
1825.....	20,098,713 45	25,771 35	2,330 85
1826.....	23,341,331 77	21,589 93	6,638 76
1827.....	19,712,283 29	19,885 68	2,626 90
1828.....	23,205,523 64	17,451 54	2,218 81
1829.....	22,681,965 91	14,592 74	11,335 05
1830.....	21,922,391 39	12,160 62	16,939 59
1831.....	21,224,441 77	6,933 51	10,506 01
1832.....	28,465,237 24	11,639 65	6,791 13
1833.....	29,032,508 91	2,759 30	394 12
1834.....	16,214,957 15	4,196 09	19 80
1835.....	19,301,310 59	10,459 48	4,263 33
1836.....	23,409,940 53	370 00	728 79
1837.....	11,169,290 39	5,493 84	1,687 70
1838.....	16,158,800 36	2,467 27	.....
1839.....	23,137,924 81	2,553 32	755 25
1840.....	13,499,502 17	1,682 25	.....
1841.....	14,487,216 74	3,261 26	.....
1842.....	18,187,908 76	495 00	.....
1843.....	7,046,843 91	103 25	.....
1844.....	26,183,570 94	1,777 34	.....
1845.....	27,528,112 70	3,517 12	.....
1846.....	26,712,667 87	2,897 26	.....
1847.....	23,747,864 66	375 00	.....
1848.....	31,757,070 96	375 00	.....
1849.....	28,316,738 82	.....	.....
1850.....	39,668,686 42	.....	.....
1851.....	49,017,567 92	.....	.....
1852.....	47,339,326 62	.....	.....
1853.....	58,931,865 52	.....	.....
1854.....	64,224,190 27	.....	.....
1855.....	53,025,791 21	.....	.....
1856.....	64,022,893 50	.....	.....
1857.....	63,875,905 05	.....	.....
1858.....	41,789,629 96	.....	.....
1859.....	49,565,824 38	.....	.....
1860.....	53,187,511 87	.....	.....
1861.....	39,582,125 64	.....	.....
1862.....	49,056,307 62	.....	1,795,331 73
1863.....	69,050,642 40	37,640,787 95	1,485,103 61
1864.....	102,316,172 99	109,741,131 10	475,648 96
1865.....	84,928,260 60	209,461,215 25	1,200,573 03
1866.....	179,046,651 58	309,226,813 42	1,974,754 12
1867.....	176,117,810 88	206,027,537 43	4,200,233 70
1868.....	161,464,599 56	191,087,589 41	1,788,445 85
1869.....	180,048,426 63	158,356,460 86	765,685 61
1870.....	194,578,374 44	184,899,756 49	929,192 88
1871.....	206,370,408 05	143,068,153 63	589,355 37
1872.....	216,370,286 77	130,642,177 72	.....
1873.....	188,089,522 70	113,729,314 14	315,254 51
1874.....	163,103,823 69	102,409,784 90	.....
1875.....	157,167,722 35	110,007,493 58	.....
1876.....	148,071,984 61	116,700,732 03	93,798 80
1877.....	130,956,493 07	118,639,497 83	.....
1878.....	130,170,680 20	110,581,624 74	.....
1879.....	137,250,047 70	113,561,610 58	.....

sary legislation toward an equitable system of taxation, certain exemptions are made, including the following: property belonging to incorporated institutions of learning endowed by private individuals; houses of worship and certain other church property; public cemeteries; personal property sufficient to cover the necessities of life; and public property, both state and national; public lands, custom-houses, school-houses, court-houses, parks, etc. The propriety of extending freedom from taxation to institutions of learning and church property is often brought in question, and powerful arguments have been employed on both sides. Inasmuch as it is very largely considered from a sentimental point of view, it is improbable that any change will soon be made on this question.

SUMMARY OF INTERNAL REVENUE RECEIPTS, FROM ALL SOURCES, FOR SEVENTEEN YEARS, 1863-79.

YEARS.	Spirits.	Tobacco.	Ferment- ed Liquors.	Banks and Bankers.	Penalties, etc.	Adhesive Stamps.	Articles and occupations formerly taxed but now exempt.
1863.....	\$5,176,530	\$3,097,620	\$1,638,934		\$37,170	\$4,140,175	\$26,932,763
1864.....	30,329,150	8,592,099	2,290,009	\$2,837,720	193,600	5,894,945	67,008,225
1865.....	18,741,422	11,401,373	3,734,928	4,940,871	520,363	11,162,362	160,638,180
1866.....	33,268,172	16,531,008	5,220,553	3,463,988	1,142,853	15,041,373	226,236,037
1867.....	33,542,952	19,765,148	6,057,501	2,046,562	1,459,171	16,091,718	186,954,423
1868.....	18,655,531	19,730,095	5,955,869	1,866,746	1,256,882	14,852,252	129,863,090
1869.....	45,071,231	23,430,708	6,099,880	2,196,054	877,089	16,420,710	65,943,673
1870.....	55,006,094	31,350,708	6,319,127	3,020,084	837,905	16,544,043	71,567,908
1871.....	46,281,848	33,578,907	7,389,502	3,644,242	636,980	15,342,733	87,36,968
1872.....	49,475,516	33,736,171	8,258,498	4,628,229	442,205	16,177,321	19,023,007
1873.....	52,099,372	34,386,203	9,324,938	3,771,031	461,653	7,702,377	6,329,782
1874.....	49,144,090	33,242,876	9,304,680	3,387,161	364,216	6,133,845	764,880
1875.....	52,081,991	37,334,362	9,144,004	4,097,248	281,108	6,557,330	1,050,111
1876.....	56,426,365	39,795,310	9,571,281	4,006,698	409,284	6,518,488	509,631
1877.....	57,469,430	41,106,547	9,480,789	3,829,729	419,999	6,450,429	238,261
1878.....	50,420,816	40,091,755	9,937,052	3,492,032	346,008	6,280,405	429,659
1879.....	52,570,285	40,135,003	10,729,320	3,198,884	578,591	6,337,533	.....
Total in 17 yrs.	\$706,650,795	\$466,275,123	\$120,446,865	\$54,427,279	\$10,245,077	\$177,650,980	\$1,010,686,588

The total cost of collecting internal revenue in the United States for the fiscal year ended June 30, 1879, was as follows:

For salaries and expenses of collectors, including pay of deputy collectors, clerks, etc.	\$1,822,000 00
For salaries and expenses of revenue agents, surveyors of distilleries, gaugers, and storekeepers.....	1,650,000 00
For dies, paper, and stamps.....	381,500 00
For salaries of clerks, officers, and employees in the office of the commissioner of internal revenue.....	253,320 00
For expenses of detecting and punishing violations of internal revenue law.....	100,000 00
Total cost.....	\$4,206,830 00
Total collections (not including commissions on sale of stamps).....	\$113,449,621 38
Cost per cent.....	3.7%

Experience has shown that taxes are least easily collected when reliance is to assessment has to be made on personal statements as to amount of taxable values; and when, as is the case in regard to distilled spirits, the temptation to illicit manufacture is great, or, as is the case in regard to cigars and other articles which admit of ready concealment, the element of smuggling enters into the question. Stamp duties are found to be the least onerous, the most easily collected, and to press the most equally in all directions, thus avoiding special occasion for irritation.

TAXATION OF COSTS is the checking or reviewing of the charges made by attorneys or solicitors for legal business; and there is an officer of the court provided for the purpose, called in England a master or a taxing-master, or a registrar, according to the nature of the court; in Scotland, he is called an auditor. Solicitors differ from all other professions in this, that they are treated as officers of the court, and they are not at liberty to charge what prices they please for the various services they perform. Hence, every step in a suit has a certain value put upon it by the court, and the business of the taxing-officers is to see that this standard is not transgressed. There are many exceptional matters, however, which arise in every suit, which often cause difficulty in apportioning a proper amount of remuneration, the taxing-officer having considerable discretion. In consequence of a taxing-officer being provided by the court, it is a right which every client of a solicitor has, if not satisfied with the bill of costs delivered to him, to have it referred to the taxing-officer to be taxed. But in general, this must be done without delay. If the taxing-officer certify that more than one-sixth too much has been charged, then not only is the client not bound to pay the excess, but the expense of the taxation must be borne also by the solicitor; whereas if less than one-sixth is taxed off, the client has to bear the expense of taxation. Not only are the expenses of a suit liable to taxation, but other kinds of miscellaneous business which a solicitor does as a solicitor. It has often of late been made matter of complaint that solicitors are not allowed

to fix their own charges, or to agree with clients upon an arbitrary charge, or a charge by commission, the tendency of the present system being to make the solicitor anxious to eke out his remuneration by lengthening the proceedings, so as to make a basis for chargeable items; but the legislature has steadily rejected hitherto all attempts to abolish the check provided by taxation.

TAXEL. See **BADGER**.

TAXICORNÉS, a family of coleopterous insects, of the section *heteromera*, having the body generally square; the thorax either concealing or receiving the head; the antennæ short; the legs adapted for running. Most of them are found in fungi and beneath the bark of trees. They are widely distributed over the world.

TAXIDERMY, the art of preparing the skins of animals for the purposes of the naturalist. The chief means employed in preparing the skin for stuffing in the case of small animals is to remove it carefully from the body, and, having cleaned away from it any adherent flesh, etc., to anoint it with arsenical soap; for the making of which there are several formulæ, the following being the most used: arsenic, 1 ounce; white soap, 1 ounce; carbonate of potash, 1 dram; distilled water, 6 drams; camphor, 2 drams. This keeps the skin supple, and prevents decay and the attacks of insects. The larger skins are generally prepared with a composition called preservation powder, which is made of the following ingredients: arsenic and burnt alum, each 1 lb.; powdered oak-bark, 2 lbs.; camphor $\frac{1}{2}$ lb. These substances are all reduced to a powder, mixed, and passed through a fine sieve. It requires to be carefully kept in well-stoppered bottles or jars, and when used, is thickly sprinkled over the flesh-side of the skin while still wet, and must be thoroughly rubbed in. Gloves should always be worn in this process to prevent danger from the poisonous compound. Some skins are prepared with alum only, and others with the oak-bark liquor of the tanner's pits. This, in the case of very large skins, answers very well.—Besides the mere preparation of the skin, the art of taxidermy is held to mean also the stuffing and mounting of them. This requires much personal experience, and as almost every group of animals must be treated differently, it is impossible to explain the various methods fully in this short notice. Various works have been written upon the subject.

TAY, the largest river in Scotland, draining nearly the whole of Perthshire (q.v.), and pouring into the German ocean a greater bulk of water than any other British river, has its source in the western part of the county of Perth. The Dochart, the principal feeder of loch Tay, rises in Ben Lui, on the borders of Argyleshire, and flowing in a n.e. direction, is joined by the Lochy, just before the united streams enter the lake. After leaving it, the Tay flows for some distance e.n.e., when turning southward, it passes, with a very winding course, Dunkeld (q.v.), and Perth (q.v.); about a mile below the latter place, it again changes its direction to e.n.e., widening at the mouth of the Earn (q.v.) into an estuary—the firth of Tay—which varies from three-fourths of a mile to three m. in breadth, and lies mostly between the counties of Fife and Forfar, joining the German ocean about 10 m. below Dundee (q.v.). From then n. and e., the Tay receives the Lyon, the Tummel, and Garry, and the Isla; and from the w., the Almond and the Earn; its entire basin comprises an area of about 2,500 sq. miles. The salmon-fishings on the Tay and its tributaries are of considerable value. The Stormontfield ponds for the propagation of salmon are 5 m. above Perth. The tide flows up the river to about a mile above Perth, to which place it is navigable by vessels of 100 tons; and to Newburgh, about 20 m. from its mouth, by vessels of 500 tons; the navigation up to Dundee, notwithstanding the many precautions which have been taken, is attended with very great difficulty, on account of the numerous and shifting sand-banks.

LOCH TAY is a long and narrow lake, picturesquely situated in a basin scooped out of the bosom of the mountains, 355 ft. above the sea-level, in length about 15 m., and average breadth 1 m., varying from 100 to 600 ft. in depth. Ben Lawers (q.v.) lies on its w. side. The loch is at times subject to violent and unaccountable agitations.

TAYLER, JOHN JAMES, D.D., 1798-1869; b. England; graduated, university of Glasgow, 1818; minister of a Unitarian congregation at Manchester, 1820; professor of church history, subsequently of theology, in the dissenting college at Manchester; principal of the college after its removal to London, taking the name of Manchester new college; was co-pastor with rev. James Martineau of the Unitarian congregation in Little Portland street. He published *Retrospect of the Religious Life of England*; *Christian Aspects of Faith and Duty*; *Attempt to Ascertain the Character of the Fourth Gospel*; *Catholic Christian Church the Want of Our Time*.

TAYLOR, a co. in n. Florida; bounded on the s.w. by the gulf of Mexico; drained by the Aucilla and the New rivers; about 1100 sq.m.; pop. '80, 2,279—165 colored. The surface is level, and well timbered. The soil is fairly fertile. The principal productions are corn, cotton, and sugar-cane. Co. seat, Perry.

TAYLOR, a co. in w. central Georgia; drained by the Flint river, which bounds it on the n.e., and by Whitewater creek; traversed by the South-western railroad; about 425 sq.m.; pop. '80, 8,595—3,826 colored. The surface is even, and heavily timbered. The soil is fertile. The principal productions are corn, cotton, live stock, and lumber. Co. seat, Butler.

TAYLOR, a co. in s.w. Iowa; drained by Platte river, river One Hundred and Two, and Honey creek; about 525 sq.m.; pop. '80, 15,635—14,842 of American birth. The surface is rolling prairie or wood-land. The soil is fertile. The principal productions are wheat, oats, corn, grass, and cattle. Co. seat, Bedford.

TAYLOR, a co. in s. central Kentucky; watered by Robinson's creek and the Green river; about 300 sq.m.; pop. '80, 9,260—1,899 colored. The surface is rolling. The soil is fertile. The principal productions are corn, oats, rye, tobacco, and cattle. Co. seat, Campbellsville.

TAYLOR, a co. in n.w. central Texas; drained by a branch of the Brazos river, about 850 sq.m.; pop. '80, 1736—1712 of American birth. The surface is level with little timber. Cattle grazing is the principal occupation. Co. seat, Buffalo Gap.

TAYLOR, a co. in n. West Virginia; drained by Tygart's Valley river, traversed by the Baltimore and Ohio railroad; about 165 sq.m.; pop. '80, 11,454—10,998 of American birth. The surface is hilly and heavily wooded. The soil is only partially fertile. The principal productions are wheat, corn, oats, and live stock. There are deposits of bituminous coal. Iron is found, and there are foundries and machine-shops. Co. seat, Grafton.

TAYLOR, ALFRED SWAINE, b. Kent, England, 1806; studied medicine at Guy's and St. Thomas's hospitals and in the best schools of Europe; and in 1830 became a member of the Royal college of physicians and surgeons. In 1845 he was made professor of medical jurisprudence at Guy's, a position he still holds. He is the author of works on chemistry, on poisoning, and on medical jurisprudence, and has often been consulted by the government in important criminal cases. He became a fellow of the Royal society in 1845.

TAYLOR, BAYARD, an American author and traveler, born at Kennett Square, Chester co., Penn., Jan. 11, 1825. Having received a common school education, he was apprenticed at 17 in a printing-office, when he began his poetical contributions to periodicals. In 1844 he published a volume of poems under the title of *Ximena*, and soon after started on a pedestrian tour of Europe, and in 1846 published *Views Afoot, or Europe seen with a Knapsack and Staff*. After his return he edited a country newspaper, then went to New York, and wrote for the *Literary World* and *Tribune*. Of the latter he became assistant-editor, and as its correspondent, made extensive travels in California and Mexico, recorded in *El Dorado, or Adventures in the Path of Empire*, 1850; up the Nile to lat. 12° 30' n., and in Asia Minor, Syria, across Asia to India, China, and Japan—recorded in his *Journey to Central Africa, Lands of the Saracen, and Visit to India, China, Loo-Choo, and Japan* (1853). Later explorations are recorded in *Northern Travel, or Summer and Winter Pictures of Sweden, Denmark, and Lapland* (1856); and *Travels in Greece and Russia, with an Excursion to Crete* (1857). In 1862-63 he was connected with the embassy at St. Petersburg; and in 1874 he visited Iceland. He resided some years in Germany, and in 1878 was appointed United States ambassador at Berlin, where he died in Dec., 1878. In 1848 he published *Rhymes of Travel, Ballads, and other Poems*; *Book of Romances, Lyrics, and Songs* (1851); *Poems of the Orient* (1854); *Poems of Home and Travel* (1855); *At Home and Abroad* (1859-62); *Hannah Thurston*, a novel (1864); *Beauty and the Beast*, and *The Masque of the Gods* (1872); *The Prophet, a Tragedy* (1874); *Home Pastorals*, etc. (1875); *Prince Deukalion*, a drama (1878). He translated *Faust* in 1871, and for the last twelve years of his life was engaged upon a life of Goethe.

TAYLOR, BAYARD (*ante*), 1825-78, b. Penn. In 1851 Mr. Taylor set out on an extended journey in the east, and afterward traveled extensively through Asia Minor, Syria, and Europe. In 1852 he crossed Asia to Calcutta, and went to China where he joined the expedition of commodore Perry to Japan. In 1862-63 he was secretary of legation at St. Petersburg, and later *chargé d'affaires*. In 1874 he revisited Egypt, and attended the millennial celebration in Iceland. For this occasion he wrote a poem, which was translated into Icelandic and read at the celebration. In Feb., 1878, he was appointed minister to Germany, where his reception was enthusiastic, and his death at the end of the same year was greatly regretted. His translation into English of Goethe's *Faust* is considered his finest contribution to literature. Among his later works are *The National Ode*, read at Philadelphia, July 4, 1876; *Boys of Other Countries; Stories for American Boys* (1876); *The Echo Club, and other Literary Diversions* (1876); *Prince Deukalion* (1878).

TAYLOR, BENJAMIN C., D.D., 1801-81; b. Philadelphia; graduated at Princeton college, 1819; began the study of theology with the rev. Dr. John M. Mason, New York, and completed his course at the theological seminary of the Reformed church, New Brunswick, N. J.; pastor of the united churches of Greenbush and Blooming Grove, N. Y., 1822-25; accepted a call to Passaic, N. J.; became pastor of the Reformed church of Bergen, N. J., 1828; relieved from active duties, 1870, and made *pastor emeritus*. He published *Annals of the Classis and Township of Bergen*, and some sermons. He had great faithfulness and symmetry of character, and was venerated in his own denomination and in other communions.

TAYLOR, BROOK, a celebrated English mathematician, was born at Edmonton, in Middlesex; Aug. 18, 1685, of a Puritan family of good position; entered St. John's college, Cambridge, in 1701, at a time when mathematical science was the prominent pursuit among the learned; took his degree of LL.B. in 1709; became a fellow of the Royal society in 1712, and its secretary in 1714, in which latter year he also took the degree of LL.D. Though so young, he had become widely known in Britain and on the continent for great proficiency in mathematical knowledge, and power and versatility of mind, having already written various valuable treatises on capillary action, on the vibration of a string, on music, etc. In 1716 he visited Paris, and was received with warm demonstrations of regard by the French savans, who respected his ability and learning, and the prominent and distinguished part he had taken in the Leibnitzian controversy. On his return to England in 1717 he resumed his habits of severe study, but was forced by declining health to resign the secretaryship in 1718. For the next three years he wandered about, residing now on the continent, now in England. He died, Dec. 29, 1731, at the age of 46. Besides his earlier works above mentioned, he contributed a series of able papers on higher algebra, dynamics, and general physics, published separately his *Methodus Incrementorum* in 1715, and a *Treatise on Linear Perspective*, the first general exposition of this subject, in 1719. During the last ten years of his life he gave himself up almost entirely to metaphysical and biblical studies. His *Methodus Incrementorum* contains, besides the famous "theorem" (see TAYLOR'S THEOREM), the first germs of the calculus of finite differences, various now common forms of infinitesimal series, with mechanical, physical, and algebraical applications. The chief use made by Taylor of his theorem is in a paper (1717) entitled "Method of Approximation to the Roots of Equations." The results of his investigations may be found in the *Phil. Trans.* (1713-23), and in his two works above mentioned.

TAYLOR, CHARLES, D.D., b. Mass., 1819; graduated at university of New York, 1840; taught, S. C., 1841-44; joined Methodist Episcopal conference, 1844; took medical degree at Philadelphia, 1848; went the same year a missionary to China; returned to America, 1854; was professor in Spartanburg female college, 1855-57; its president, 1857-58; Sunday-school secretary of M. E. church, south, 1858-62; president of Wesleyan university at Millersburg, Ky. He published *Five Years in China*, and numerous articles in periodicals.

TAYLOR, EDWARD T., 1794-1871; b. Va.; was a sailor in his youth; was captured on a privateer in the war of 1812; in prison at Dartmoor, England, and chaplain to the prisoners; was ordained a preacher in connection with the New England Methodist Episcopal conference, 1819; became minister of the Seamen's Bethel, 1828. He was greatly distinguished as the sailor's preacher, and had great influence over his rough auditors by his warmth of heart, native wit, and natural eloquence. His common designation was "father Taylor." He visited Europe in 1832 and Palestine in 1842; was chaplain to the U. S. frigate sent with relief to Ireland during the famine in 1846.

TAYLOR, GEORGE, 1716-81; b. Ireland; received a fair education, and emigrated to the United States in 1736. He was at first a common laborer in a Pennsylvania foundry, but quickly rose, and in time became a large proprietor of iron foundries in Northumberland county. In 1764 he was chosen a member of the colonial assembly, and later served in the provincial assembly for five years. He was active in aiding the movements which led to the revolution, and in 1776 became a member of the continental congress. He signed the declaration of independence, though he was not a member of the congress until after it was passed. The latter part of his life was spent in Delaware.

TAYLOR, ISAAC, 1759-1829; b. London; originally a line-engraver, he removed from the metropolis, 1786, to Lavenham, Suffolk, to pursue his profession and train his children in a quiet country town; became minister of an Independent church, Colchester, Essex, 1790-1810, and at Ongar from 1810 until his death. Among his publications were many on educational subjects.

TAYLOR, ISAAC, b. at Lavenham, in Suffolk, 1787, d. at Stanford Rivers, in Essex, 1865, eminent as a Christian philosopher, artist, and mechanic, was the third of his name who attained distinction—his grandfather and father (known as Isaac Taylor of Ongar) being both named Isaac, and each in his way distinguished. Charles Taylor, the editor of *Culmet*, was an uncle, and Jane Taylor (author of the *Q. Q. Papers*) and Ann Taylor (Mrs. Gilbert of Nottingham), joint-authors of *Hymns for Infant Minds*, were sisters of the subject of this article. The literary career of Isaac Taylor extended over nearly half a century. It began in 1818, in contributions to the *Eclectic Review*, for which Robert Hall, John Foster, and Josiah Conder then wrote, and ended in 1865, in contributions to *Good Words*, in which the name of the veteran figured with those of men who were unborn when he was in the height of his reputation. Between 1822 and 1827 he published *Elements of Thought; Characters of Theophrastus*, with illustrations, etched by himself; *The History of the Transmission of Ancient Books to Modern Times; The Process of Historical Proof*, a translation of Herodotus, and the *Memoirs and Correspondence of Jane Taylor*, his sister, who has already been mentioned. In 1829 he published, anonymously, *The Natural History of Enthusiasm*, which ran rapidly through several editions; and between 1829 and 1836 he published in succession *Fanaticism*,

Spiritual Despotism, *Saturday Evening*, and *The Physical Theory of Another Life*. In 1836 appeared *Home Education*. Thereafter he was a long time occupied upon a new translation of Josephus, undertaken jointly with the rev. Dr. Traill, and which was illustrated by etchings executed by himself. Within the last 13 years of his life appeared *Loyala*, *Wesley*, *The Restoration of Belief*, *Logic of Theology*, *Ultimate Civilization*, and *The Spirit of Hebrew Poetry*. Besides these numerous works, Isaac Taylor wrote many articles for the graver quarterly reviews, which are as yet uncollected. He had been educated as an artist, and some of his designs, executed before he betook himself chiefly to literature, have evoked the warmest praise from the most scrupulous critics, who have wondered how one with such a genius for art could have deserted it. It would be impossible to give here any account that would be intelligible of his numerous mechanical inventions; it must suffice to say that, by two of his inventions, he revolutionized the art of calico-printing. Isaac Taylor married in middle life, and had a large family, whose home education, as liberal-minded but pious Christians, was among, and not one of the least of, the tasks of his life.

TAYLOR, The rev. ISAAC, M.A., vicar of Holy Trinity, Twickenham, and eldest son of the preceding, was b. at Stanford Rivers, Mar. 3, 1829. He is the author of *The Liturgy and the Dissenters*, and one or two other theological pamphlets; but has best maintained the literary distinction of his family by his works on philology. His *Words and Places, or Etymological Illustrations of History, Ethnology, and Geography* (1864), of which a second edition, revised and enlarged, was published in 1865, is a work of great research as well as erudition, and has done more toward the elucidation of the local names of English places than any book yet published. In *Etruscan Researches* (1874) Taylor tries to prove that the Etrurians were allied to the Turkish or Mongolian races. This proposition, however, is not well established, and the work has received severe handling from critics, especially from prof. Max Müller. In 1876 Taylor published *The Etruscan Language*.

TAYLOR, ISIDORE SÉVERIN JUSTIN, Baron, b. Brussels, 1789; studied art and became a writer and artist. Politically he sided with the Bourbons, and served in the Spanish campaign of 1823. The obelisk of Luxor now in the *Place de la Concorde*, Paris, was brought from Egypt by him. Baron Taylor has acted as purchaser of pictures for many of the great French collections, is a grand officer of the legion of honor and has written several dramas and treatises on art and kindred subjects.

TAYLOR, JEREMY, one of the greatest names in the English church, was the son of a Cambridge barber, and was born in that town, Aug. 15, 1613. At the age of 13 he entered Caius college as a sizar, and after seven years' strenuous and brilliant study in classics and theology, took the degree of M.A. Like archbishop Usher, he was admitted to holy orders before he had reached his 21st year. Soon after, he attracted the notice of Laud (who had a regard for learning, if none for liberty), and was preferred by him to a fellowship at All Souls, Oxford (1636). About the same time, he was appointed chaplain in ordinary to the king; and in 1638, rector of Uppingham, a preferment which he retained till the successes of the parliamentarians deprived him of it. The first notable publication of Taylor's was a defense of the church, entitled *Episcopacy asserted* (Oxford, 1642). It procured for him the honor of D.D. During the next three years, Taylor probably accompanied the royal army; but when fortune had unmistakably declared against the king he withdrew into Wales (1645-46), and, in conjunction with Mr. W. Wyatt of St. John's college, Oxford, opened a school at Newton, in Caermarthenshire. It appears to have been a pretty successful adventure, and many of his scholars, we are told, "having, as it were, received instruction from this prophet in the wilderness, were transplanted to the universities." Taylor also found a patron in the earl of Carbery, who was then living at the family seat of Golden Grove, in the same county, and who appointed him his domestic chaplain. But if this period of Taylor's life had become to the outward eye obscure and mean, it is rendered illustrious by the splendor of his literary achievements. Between 1647 and 1660, the long 13 years of his enforced seclusion, appeared all his great works, and remembering their unsurpassed merits, we are almost disposed to feel grateful to those who expelled him from his rectory, and drove him to strictly literary pursuits. In 1647, was published the *Liberty of Prophesying*, a work written on behalf of the clergy of the church of England, who were being expelled from their livings by the victorious Puritans, but in which the pleadings are based on principles far more comprehensive and tolerant than the age was disposed to acknowledge; in 1650, the *Life of Christ* (2 vols.), one of the most popular of his productions, and *The Rule and Exercises of Holy Living*; in 1651, *The Rule and Exercises of Holy Dying*, a portion of his *Sermons*, and the *Discourse of the Divine Institution, Necessity, and Sacredness of the Office Ministerial*; in 1652, a *Discourse on Baptism, its Institution, and Efficacy upon all Believers*; in 1653, 25 additional *Sermons*; in 1654, *The Presence Real and Spiritual of Christ in the Blessed Sacrament*; in 1655, *The Guide of Infant Devotion, or the Golden Grove*, and the *Unum Necessarium, or the Doctrine and Practice of Repentance*, a decidedly Pelagian treatise, which involved him in a considerable controversy; in 1657, a *Collection of Polemical and Moral Discourses*, a *Discourse on Friendship*, etc.; and in 1660, his famous *Ductor Dubitantium, or the Rule of Conscience in all her General Measures*, the most learned,

subtle, and curious of all Taylor's works. It was dedicated to Charles II. He was a staunch royalist, a splendid scholar, a consummate theologian, and a man of wonderful literary genius, and so it was in the nature of things almost impossible that he should escape preferment. Before 1660 had expired, he was elevated to the bishopric of Down and Connor, a dignity which he only retained some seven years, dying Aug. 13, 1667. Taylor was not happy in his Irish see. Before a year was over, he was anxious to be delivered from it as from a "place of torment." The Scotch Presbyterian ministers were "incendiaries"—they robbed him of the "people's hearts;" they even "threatened to murder" him; his only hope was in the government and the military. Altogether, it is a melancholy spectacle to behold the finest ecclesiastical genius of the time half broken-hearted by petty squabbles with intolerable fanatics, who had, nevertheless, in the points at issue between them and Taylor, something like justice on their side. No modern mind would hesitate for an instant to acknowledge that the Scoto-Irish Presbyterian clergy were perfectly entitled to act as they did, and yet we fear it is too plain that the good bishop would have gladly seen them prohibited by an Episcopalian soldiery. Nay, the author of the *Liberty of Prophesying* went a step further; and on one occasion, only three months after his consecration, actually deposed 36 Presbyterian ministers occupying livings which the restoration had inconsiderately and tyrannically declared to be Episcopalian. Some very interesting information in regard to this all but unknown period of Taylor's life is to be found in *Notes and Queries* (Nov. 11, 1865).

Taylor, sometimes styled the modern Chrysostom (q. v.), on account of his golden eloquence, has no equal in the whole series of ecclesiastical writers for richness of fancy. All other divines—patristic, mediæval, and modern—show poor and meager beside him in this respect. Some are more logical, or penetrating, or profound; some grasp more clearly the spiritual significance of doctrine, or display a deeper knowledge of human nature; but Taylor ranks among the first men of his age in point of learning, subtlety of argument, elevation of devout feeling, and philosophic largeness of view, while his inexhaustible imagery, shining "like the glossy purples of a dove's neck," and full of all tender and pathetic beauty, reminds us of Spenser and Shakespeare, of Sidney and Fletcher, rather than of the somber order of theologians.—The best edition of Taylor's works is by the rev. C. P. Eden, M.A., fellow of Oriel college, Oxford (10 vols., London, 1854).

TAYLOR, JOHN, 1580–1656; b. England; a waterman on the Thames, commonly called "the water poet." He tells, in *The Pennyless Pilgrimage, or the Moneyless Perambulation of John Taylor, alias the King's Majesty's Water Poet*, "how he traveled on foot from London to Edinburgh, not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging." He complains of his treatment in these frolics in his *Scourge for Baseness*. He collected in 1630 *All the Works of John Taylor, the Water Poet*.

TAYLOR, NATHANIEL WILLIAM, D.D., 1786–1858; b. Conn.; graduated at Yale college, 1807; studied theology five years with Dr. Dwight; ordained pastor of the First church (Congregational), New Haven, 1812, as successor of Moses Stuart; elected Dwight professor of didactic theology in Yale college, 1822, holding the position till his death, having in 36 years given instruction to 700 students preparing for the ministry. While a pastor he wrote a series of articles for the *Monthly Christian Spectator* on the Unitarian controversy. In 1828 he preached in New Haven the *concio ad clerum*, presenting views on native depravity which were denounced as heretical, and led to a protracted discussion between him and Dr. Tyler. After his death, four volumes of his works were edited by president Noah Porter: *Practical Sermons; Lectures on the Moral Government of God*, 2 vols.; *Essays, Lectures, etc., upon Select Topics in Revealed Theology*. The views for which he was attacked would now scarcely give rise to any controversy. He was a man of acute intellect and deeply evangelical spirit.

TAYLOR, RICHARD, b. Florida; son of president Zachary Taylor. At the beginning of the rebellion he joined the confederate army, and commanded a Louisiana regiment at the battle of Bull Run. He served under Jackson in Virginia, with Kirby Smith in the trans-Mississippi department, and defeated Banks in the latter's Red River expedition. In 1864, then ranking as maj. gen., he took command of the east Louisiana department and surrendered in 1865 to gen. Canby. He is a brother-in-law of Jefferson Davis. Since the war he has resided in Louisiana.

TAYLOR, SAMUEL HARVEY, LL.D., 1807–71; b. New Hampshire; graduated at Dartmouth, 1832, and Andover theological seminary, 1837; tutor at Dartmouth, 1836–37; principal of Phillips academy, Andover, until his death. He was unsurpassed for thoroughness as a classical teacher. From 1852 he was one of the editors of the *Bibliotheca Sacra*. Among his publications are: *Methods of Classical Study; Kreh's Method for Writing Latin*, from the German; *Kühner's Elementary Grammar of the Greek Language*, from the German; *Memoir of the Rev. Edward L. Parker*.

TAYLOR, STEPHEN WILLIAM, LL.D., 1791–1856; b. Mass.; graduated at Hamilton college, 1817; taught the Black River academy at Lowville, N. Y., 14 years; teacher of a private school 3 years; took charge in 1834 of the preparatory department of Hamilton institution; was professor of mathematics and natural philosophy there, 1838–45; was its president after it was organized as Madison university in 1851.

TAYLOR, THOMAS, 1758-1835; b. London; generally known as the Platonist; spent three years at St. Paul's school; afterward became pupil to the rev. Mr. Worthington, a classical scholar, intending to prepare for the ministry. But a premature marriage and pecuniary difficulties compelled him to relinquish study for the ministry, and he became clerk in a banking house, afterward assistant-secretary to the society for the encouragement of arts, manufactures, and commerce, devoting his spare time to the study of Greek literature and the elucidation of the Platonic philosophy. He delivered a course of lectures on the Platonic philosophy, and taught some pupils the languages and mathematics. He determined to translate all the untranslated works of the ancient Greek writers. The duke of Norfolk and a retired tradesman, Mr. Meredith, published his translations of Plato, Aristotle, and other Greek writers. His writings number in all 38 distinct works; some of them, as the Plato and Aristotle, consisting of 5 and 9 vols. respectively. Besides his translations of Greek writers, he published works in other departments.

TAYLOR, TOM, 1817-80; b. England; educated at Glasgow and Cambridge. He was for two years professor of the English language and literature at University college, London; was afterward called to the bar, and for the next 21 years held various government offices. He was the author of nearly 100 dramatic pieces, among the most popular of which are: *Still Waters Run Deep*; *The Overland Route*; *Victims*; *Twixt Axe and Crown*; and *The Ticket-of-Leave Man*. He was a frequent contributor in prose and verse to *Punch*, of which he was for some time editor.

TAYLOR, WILLIAM J. R., D.D., b. N. Y., 1823; son of Dr. Benjamin C.; graduated at Rutgers's college, New Jersey, 1841, and at the theological seminary of the Reformed church, New Brunswick, 1844; pastor of Reformed church, New Durham, N. J., 1844-46; Jersey City, 1846-49; Schenectady, 1849-52; Third Reformed church, Jersey City, 1852-54; Third Reformed church, Philadelphia, 1854-62; corresponding secretary American Bible society, 1862-69; pastor Clinton street Reformed church, Newark, N. J., 1869; president of general synod of Reformed church, 1871; editor-in-chief of *The Christian Intelligencer*, 1872-76. His church in Newark is one of the leading churches in the city.

TAYLOR, WILLIAM MACKERGO, D.D., b. Scotland, 1829; graduated at university of Glasgow, 1849; studied theology in Edinburgh; ordained pastor of the United Presbyterian church at Kilmaurs, 1853; pastor of the United Presbyterian church at Derby road, Liverpool, 1855; came to the United States, 1871, as delegate of the United Presbyterian church of Scotland to the general assembly of the Presbyterian church at Chicago; became pastor of the Broadway Tabernacle church (Congregational), New York, 1872. He received the degree of D.D. from Yale college and Amherst the same day. He has published *Life Truths*; *The Miracles: Helps to Faith, not Hindrances*—a reply to Renan's *Life of Jesus*; *The Lost Found, and Wanderer Welcomed*; *Memoirs and Remains of Rev. M. Dickie*, Bristol; *David, King of Israel*; *Elijah the Prophet*; *The Ministry of the Word*. He has delivered a course of lectures in Yale divinity school on the "Lyman Beecher foundation." His preaching draws a large and attentive congregation.

TAYLOR, WILLIAM ROGERS, b. R. I., 1811; entered the U. S. navy in 1828. During the Mexican war he was on the sloop *St. Mary's*, and took part in the engagement at Tampico Bar, and the siege of Vera Cruz. He served in the war of the rebellion, participated in the attacks on forts Wagner and Sumter, 1863, and afterward in the attacks upon fort Fisher. He was made rear-admiral in 1871.

TAYLOR, ZACHARY, 12th president of the United States, was born in Orange co., Va., Nov. 24, 1784, son of col. Richard Taylor, an officer of the war of independence, and one of the first settlers of Louisville, Ky., where Taylor was taken in early childhood, and grew up to his 24th year, working on a plantation, with only the simplest rudiments of education. His elder brother had received a lieutenancy in the army, and died in 1808, when Taylor was appointed to the vacant commission. In 1810 he was promoted to a captaincy; and in 1812, with 50 men, two-thirds of whom were ill of fever, he defended fort Harrison, on the Wabash, against a large force of Indians led by the famous chief Tecumseh. Promoted to the rank of maj. for his gallantry, he was employed during the war in fighting the Indian allies of Great Britain. In 1822 he built fort Jesup; in 1832 he served as col. in the Black Hawk war; and in 1836 was ordered to Florida, where he gained an important victory over the Seminole Indians at Okeechobee, for which he was appointed brig.gen., and made commander of the United States forces in Florida. In 1840, having been appointed to the command of the s.w. western department, he purchased an estate at Baton Rouge, Louisiana. On March 1, 1845, the U. S. congress passed the resolution for the annexation of Texas, formerly a province of Mexico, and for some time an independent republic. Texas claimed the Rio Grande for her s. western boundary; Mexico insisted that there could be no claim beyond the Nueces, and prepared to defend the disputed, if she could not reconquer the whole, territory. Gen. Taylor was ordered to Corpus Christi, which point he occupied in Nov. with a force of 4,000. On Mar. 8, 1846, he moved toward the Rio Grande, across the disputed territory, and built fort Brown, opposite and commanding the Mexican port of Matamoras. Gen. Ampudia, the Mexican commander, demanded that he should retire

beyond the Nueces, pending negotiations; and on the refusal of gen. Taylor, his successor, gen. Arista, crossed the Rio Grande with a force of 6,000. On May 8, he was defeated at Palo Alto by gen. Taylor, with a force of 2,300; and a few days after, driven from a new position at Resaca de la Palma, across the Rio Grande. War was declared by congress to exist by the act of Mexico; 50,000 volunteers were called for, Taylor made maj. gen., re-enforced, and ordered to invade Mexico. On Sept. 9, with 6,625 men, he attacked Monterey, which was defended by about 10,000 regular troops. After 10 days' siege and 3 days' hard fighting, it capitulated. Gen. Scott having been ordered to advance on the city of Mexico by Vera Cruz, withdrew a portion of the troops of gen. Taylor, leaving him only 5,000 volunteers and 500 regulars, chiefly flying artillery, to meet an army of 21,000, commanded by president Santa Anna. He took a strong position at Buena Vista, fought a desperate battle, and won a decided victory. This victory, against enormous odds, created the utmost enthusiasm; and gen. Taylor, popularly called "old rough and ready," was nominated for president of the United States over Henry Clay, Daniel Webster, and gen. Scott; and this "ignorant frontier col., who had not voted for 40 years," and was a slaveholder, was triumphantly elected over gen. Cass, the democratic, and Martin Van Buren and Charles Francis Adams, free-soil candidates. Entering upon the presidency in 1850, he found a democratic majority in congress, with a small but vigorous free-soil party holding the balance of power, while the most exciting questions connected with the extension of slavery, as the admission of California, the settlement of the boundaries of Texas, the organization of the newly-acquired Mexican territories, etc., were agitating the country, and threatening a disruption, postponed by the compromises introduced by Mr. Clay. Worn down by the unaccustomed turmoil of politics, the rough, good-natured old soldier did not long enjoy his honors. On July 4, 1850, four months after his inauguration, he was attacked with bilious colic, and died on the 9th.

TAYLOR'S THEOREM, so called from its discoverer, Dr. Brook Taylor (q.v.), is a general method for the algebraic development of a function of a quantity, x , in powers of its increment h , and may be thus briefly explained and illustrated: Let $f(x+h)$ denote any function of $x+h$ (subject to the limitations below), then $f(x+h) = f(x) + f'(x)h + f''(x)\frac{h^2}{1.2} + f'''(x)\frac{h^3}{1.2.3} + \dots$, where $f(x)$ is the same function of x , as $f(x+h)$ is of $x+h$, and $f'(x)$, $f''(x)$, etc., are the first, second, etc., differential coefficients of $f(x)$. By a supplementary theorem, due to Lagrange, who was the first to appreciate to the full the value of Taylor's discovery, it was shown that the sum of all the terms of the series after n terms, could be represented by $f^n(x+th)\frac{h^n}{1.2\dots n}$, where t is some positive

fraction less than unity. The theorem supposes that between certain limits, indicated by $h = 0$, and h = some finite quantity, neither $f(x)$ nor any of its derived functions vanish, or all of them do not become infinite; and the cases in which these conditions are not satisfied are often spoken of as instances of the "failure of Taylor's theorem." An important particular case of this theorem, known as *Maclaurin's*, or (more properly) *Stirling's Theorem*, was independently discovered; it is that case of the general theorem in which the various functions of x are made functions of zero, and is written $f(0+h)$

$= f(0) + f'(0)h + f''(0)\frac{h^2}{1.2} + \dots$. The best illustrations of these theorems are the

binomial, exponential, logarithmic, and circular series; thus if the function be $(x+h)^a$, then $f(x) = x^a$, $f'(x) = ax^{a-1}$, $f''(x) = a(a-1)x^{a-2}$, etc.; and by substitution of these values we obtain Newton's *binomial* theorem; if the function be $a^x + h$, Taylor's series gives us as its equivalent $a^x(1 + h \log a + \frac{h^2}{1.2} \log a^2 + \dots)$; and Maclaurin's gives

$a^h = 1 + h \log a + \frac{h^2}{1.2} (\log a)^2 + \dots$, which latter is the *exponential* theorem, and

may be obtained from Taylor's series by division; if the function be $\log(1+x+h)$, $\log \frac{x+h}{x}$ being one of the cases in which Taylor's theorem fails), then Maclaurin's series gives the *logarithmic* theorem, $\log(1+h) = h - \frac{h^2}{2} + \frac{h^3}{3} - \dots$; and the same theorem

gives the various series expressing the values of $\sin h$, $\cos h$, $\sin^{-1}h$, etc., etc. The history of this celebrated theorem is remarkable. On the first publication of the *Methodus Incrementorum*, it was entirely neglected by Leibnitz, who, in ignorance of its value, severely criticised the whole work; while the bitter hostility of John Bernoulli to British men of science, blinded him to the existence of any merit in any part of the work. The theorem never appeared in any of the works on the calculus published before D'Alembert's *Recherches*, and after that was given only in the French *Encyclopaedia*; but neither D'Alembert nor Condorcet seems to have known that it was Taylor's, or to have fully appreciated its importance; and it was not till Lagrange, in the *Berlin Memoirs* for 1772, gave the name of its true author, and proposed to make it the foundation of the differential calculus, that it assumed that important position which it deserved to hold.

TAZEWELL, a co. in central Illinois, drained by the Mackinaw and Illinois rivers, the latter its n. boundary; traversed by the Chicago and Alton, the Toledo, Peoria and Warsaw, and the Indianapolis, Bloomington and Western railroads; about 550 sq.m.; pop. '80, 29,679—24,674 of American birth. The surface is in great part prairie land, and produces all the cereals in abundance. There are flour-mills, distilleries, and manufacturing of tools, carriages, and other articles. Co. seat, Pekin.

TAZEWELL, a co. in s.w. Virginia adjoining West Virginia; drained by the Clinch, Bluestone, and Holston rivers; 600 sq.m.; pop. '80, 12,861—12,839 of American birth, 1834 colored. The surface is crossed by the Clinch range of mountains and is rugged, though the valleys are productive; corn, oats, wheat, hay, wool, and dairy-products are the staples. There are several distilleries, tanneries, and cloth-dressing factories. Co. seat, Tazewell Court-House.

TAZEWELL, HENRY, 1753–90; b. Va.; after graduating from William and Mary college, studied law and practiced successfully in his native state. From 1775 to 1785 he was a member of the Virginia house of burgesses, and served on the committees which drew up the declaration of rights and state constitution. He was for many years a judge of the supreme court and court of appeals. In 1794 he was chosen U. S. senator, and in 1795 was president *pro tem.* of the senate.

TCHAD, or **TSAD, LAKE**, a large lake in Soudan, northern Africa, lat. 12° 30' to 14° 30' n., long. 13° to 15° 30' east. Its size varies with the time of year; it has an area of 10,000 sq.m. in the dry season, and is sometimes four or five times as large in the rainy months. According to Rohlf's it is 1150 ft. above sea-level. The shores are low, and for the most part unattractive; and a strip of swampy ground surrounds the fine open sheet of water which is the actual Tchad, and the margin of which is lined by papyrus and tall reeds, of from 10 to 14 ft. in height. Its depth in ordinary years is from 8 to 15 ft., but in some years the waters rise much higher; and of the islands, of which there are many densely peopled, only the more elevated afford shelter to the inhabitants. River horses and crocodiles swarm in the lake, and fish and water-fowl are abundant. The banks are infested by a tribe called the Budduma or Jedina, who live by piracy. The inhabitants are black or dark-brown, have regular features, and are decently clothed. From the w. the large river Yaobe enters the lake; and from the s. the Shari, which in its lower course is upward of 1800 ft. broad, and has a large western affluent, the Ba Logon. Lake Tchad, whose waters are perfectly fresh, has no regular outlet. But Dr. Nachtigal has proved that it sometimes overflows toward a great depressed plain lying 300 m. to the n. east.

TCHERKA'SI, a t. of Russia, in the government of Kiev, 100 m. s.e. of the town of Kiev, on the Dnieper. Pop. '67, 14,433.

TCHERKASK, **STAROI** (Old Tcherkask), a t. of s. Russia, formerly the capital of the country of the Cossacks of the Don, stands on the right bank of the Don, 13 m. s. of New Tcherkask (see NOVOTCHERKASK), the present capital. Pop. 15,000.

TCHERNIGOV, a government in s.w. Russia, drained by the Dnieper and the Desna rivers; about 20,000 sq.m.; pop. 70, 1,659,600. The surface is generally level. The soil is extremely rich. The principal productions are brandy, honey, and cattle. The horses raised here have a high reputation. Capital, Tchernigov.

TCHUKTCHEES, a wandering tribe in Siberia, supposed to be kin to the Koriaks, living near Behrings strait. They closely resemble the Indians of the adjacent continent. The greater part of them wander from spot to spot with herds of reindeer, while some bands live on the coast and support themselves by seal and walrus hunting. Their number is unknown, and estimates vary greatly. The name Tchuktchees is also given to an Alaska tribe of Koniagas, living on Bristol bay, and noted for their ingenious carving.

TEA, *Thea*, a genus of shrubs of the natural order *ternstramiacea*, very nearly to the genus *camellia* (q.v.), and distinguished from it only by the not deciduous calyx, and by the dissepiments remaining connected in the center of the capsule after it opens. The genus seems to derive its importance entirely from a single species, the dried leaves of which are the tea of commerce, one of the most important articles of commerce in the world, and yielding the most esteemed and extensively used of all non-alcoholic beverages. This species, the tea shrub or CHINESE TEA (*T. sinensis*), is 20 to 30 ft. high, but in a state of cultivation only 5 to 6 ft. high, with numerous branches and lanceolate leaves, which are 2 to 6 in. long. The flowers grow singly or two or three together in the axils of the leaves; they are rather large, white, and fragrant, with 5-parted calyx, 6 to 9 petals, and many stamens. By cultivation for many centuries, numerous varieties of this plant have been produced in China, some of which have been reckoned as distinct species, particularly *T. viridis*, formerly supposed to yield green tea, *T. Bohea*, formerly supposed to yield black tea, and *T. stricta*. Of these, the first-named has the longest, and the last has the shortest leaves. The Assam tea, which has been called *T. Assamensis*, appears also to be a mere variety of the same species.

The cultivation of tea in China is chiefly confined to the regions between n. lat. 24° to 35° and e. long. 115° to 122°. Tea for domestic use is, however, cultivated both in more southern and more northern regions. The plant is to be accounted subtropical, but bears a tropical climate well, and can also accommodate itself to cold winters. In the neighborhood of London it often endures all the frost of winter without protection. In few of the countries into which it has been introduced, however, is the flavor of the dried leaf such as it is in China. The use of tea is said to have been introduced into China itself from the Corea about the 4th c. of the Christian era, and to have extended to Japan about the 9th century. The Chinese cultivate it chiefly on the southern slopes of hills. A new plantation is made by sowing the seed in holes at proper distances, two or three seeds being put into a hole to secure a plant. The first crop is obtained in the third year, when the shrub is by no means full-grown. When about seven years old, it yields only a scanty crop of hard leaves, and is cut down, when new shoots rise from the root, and bear fine leaves in abundance. This is repeated from time to time, till the plant dies at about the age of thirty years.

History and Commerce.—All that can be affirmed regarding the early history of this beverage is, that it appears to have been used for ages in China, where it is believed by the natives to be indigenous. It first became known to Europeans at the end of the 16th c., though it is only mentioned by the Portuguese writer Maffei in his *Historiæ Indicæ*, who refers to it as a product both of China and Japan. The first reference to it by a native of Britain is in a letter dated June 27, 1615, written by a Mr. Wickham, which is in the records of the East India company; and it is curious to observe that both the Portuguese and English writers referred to use their own rendering of the native name, which is *tscha*. Maffei calls it *chia*, and Mr. Wickham, *chau*. From this time, it became gradually known to the wealthy inhabitants of London, in the form of occasional presents of small quantities from India, obtained from China, or by small lots in the markets from time to time, but always exorbitantly dear, fetching sometimes as much as £10 the lb., and never less than £5. A rather large consignment was, however, received in 1657; this fell into the hands of a thriving London merchant, Mr. Thomas Garraway, who established a house for selling the prepared beverage; and that house, under the name of "Garraway's coffee-house," is still a famous establishment in that city. From 1660 until 1689, a duty was levied on the drink made with tea at the rate of 8d. per gallon; but from the latter date a duty of 5s. per lb., with an addition of 5 per cent *ad valorem*, was levied. For many years, the duties, although occasionally changed, were always very high, and were levied by both the customs and the excise. The expiration in 1683 of the charter of the East India company, which had held a complete monopoly of the tea-trade, produced a change; the *ad valorem* duty was abolished, and differential duties of 1s. 6d., 2s. 2d., and 3s. per lb. were substituted; but they worked badly, and were abandoned in 1833 for one uniform rate of 2s. 1d. per lb., to which, in 1840, was added an additional 5 per cent. From that time to the present, several changes, always reductions, have taken place, until now, when the duty is only 6d. per lb. The import for the year 1875 was nearly 200,000,000 lbs., value about £14,167,000; the import for 1876 was 185,698,190 lbs., value £12,812,832; for 1877, 187,515,284 lbs., value £12,480,740.

Much mystery and error for a long time existed upon the subject of the species producing the tea of commerce. By many it was said that the qualities known as black teas were produced by the species known to botanists as *T. Bohea*, and the green teas from *T. viridis*. Others held that only one species was used to make both the black and green varieties, and that the difference arose from the method and time of preparation. The eminent botanical traveler, Mr. Robert Fortune, has, however, entirely set the question at rest by investigating the matter on the spot. He found that in the Canton district, where black teas alone are prepared, only the *T. Bohea* is grown; while in the province of Che-kiang only *T. viridis* is grown, and green teas made. But the cultivation of the latter plant he also found to be absolutely universal in the Fokien district, although the inhabitants make only black teas. The tea-farms are mostly in the n. of China, and are usually of small size, and require much attention: for the plant will only thrive in well manured or very rich soil, and the spaces between the plants, which are 4 ft. apart, must be kept in good order, and free from weeds. The farms always occupy the hill-sides, where the soil is deep and well drained. Although an evergreen, the leaves can only be gathered at certain seasons: the first is in April, when the new leaves begin to burst from the buds; and some of these in their most tender state are gathered and made into young hyson of the finest quality; so fine, indeed that it has rarely been brought to England, because it is said to lose flavor by the sea-voyage. Much is, however, sent overland to Russia, where it fetches an exorbitant price. The ordinary picking begins just after the summer rains are over, at the beginning of May; and later in the season, a third picking takes place, the produce of which is inferior, and used only by the poorer classes of the country. The later gatherings are more bitter and woody than the earlier, and yield less soluble matter to water. The leaves, when freshly plucked, possess nothing of the odor or flavor of the dried leaves, these properties being developed by the roasting which the leaves undergo in the process of drying. Moreover, different qualities of tea are prepared from the same leaves, which may be made to yield green or black teas at will.

For a description of the specific processes for obtaining the green and the black teas generally, we refer to Mr. Fortune's work (*Tea Countries of China*), or to Johnson's *Chemistry of Common Life*, vol. i, p. 161, in which it is quoted. It is sufficient here to remark, *first*, that, in the process of drying, the leaves are roasted and scorched in such a way as necessarily to induce many chemical changes in them; the result of such changes being to produce the varieties of flavor, odor, and taste by which the different kinds of teas are distinguished; and *secondly*, that the different colors of green and black teas are due to the mode in which the leaves are treated. For *green teas* the leaves are roasted in pans almost immediately after they are gathered. After about five minutes' roasting, during which they make a cracking noise, become moist and flaccid, and give out a good deal of vapor, they are placed on the rolling-table, and rolled with the hands. They are then returned to the pans, and kept in motion by the hands: in about an hour, or rather more, they are well dried, and their color, which is a dull green, but becomes brighter afterward, has become *fixed*. The essential part of the whole operation is now over, nothing more being required than to sift and re-fire it. For *black teas*, the leaves are allowed to be spread out in the air for some time after they are gathered; they are then further tossed about till they become flaccid; they are next roasted for a few minutes, and rolled, after which they are exposed to the air for a few hours in a soft and moist state; and lastly they are dried slowly over charcoal fires, till the black color is fairly brought out. Hence the dark color and distinguishing flavor of black teas seem due to the long exposure to the atmosphere in the process of drying, and the oxygen of the air acting rapidly upon the juices of the leaf, and especially upon the astringent principle during this exposure. For the purpose of giving special scents to different varieties of tea, numerous odoriferous plants are employed in different parts of China; the cowslip-colored blossoms of the sweet-scented olive (*olea fragrans*) communicate an especially fragrant scent to tea.

The adulteration of tea, when the duty was very high, was probably carried on to a great extent; but notwithstanding the terrible tales of alarmists, it may be asserted that very little adulteration of tea is now carried on in Great Britain. In China, spurious teas have been prepared and sent to this country under the name of "lie teas," but they had no sale, and of course were discontinued. The Chinese give an artificial coloring to the green teas sent to Europe because it pleases the eye, but the coloring matter is very innocuous, and is never produced by heating over copper plates—a popular error, which has been persisted in for a long time without a shadow of truth for its foundation. Prussian blue in very minute proportion, and a species of native indigo and gypsum, are the real materials employed for giving the face, as it is called.

In 1836 the culture of tea was attempted on a large scale in India, under the direction of the able and indefatigable botanists, Dr. Royle and Dr. Falconer; and after some difficulty, a good supply of plants was introduced to the districts of Kumaon and Gurhwal, and in the mean time plantations formed at an earlier period in Assam were making great progress. From these sources a steadily increasing supply is received, the value of which in 1876 was £2,473,882. The quality, too, is superior to many of the Chinese teas, a fact which is testified by the large quantity of Indian teas now used. The only other country which has grown tea successfully is Brazil, where, in the high lands, tea of the most excellent quality is produced, and in sufficient quantities to supply a large portion of the Brazilian demand.

The varieties of tea are very numerous; the following are those found in the shops of Great Britain:

GREEN TEAS.—*Chinese*: (1). Gunpowder sorts—viz., Shanghae, Ping-suey or pin's-head, Moyune, imperial Moyune, and Canton; (2). Hyson sorts—viz., Shanghae, Shanghae young, Moyune, Moyune young, Canton young, and Twankay or imperial Hyson. *Japanese*: Gunpowder and young Hyson. *Java*: Gunpowder.

BLACK TEAS.—*Chinese*: (1). Congo sorts—viz., Canton, Foo-chow-foo, Hung-muey, Oopack, Kaisan, and Oouam; (2) Pekoe sorts—viz., plain orange, Foo-chow, scented orange, Canton scented orange, and flowery Pekoe, Oolong, and Souchong. *Assam*: Congo, orange Pekoe, and Souchong. *Java*: Congo and imperial. The latter is made up into little balls about the size of a pea, and is rare.

The use of the infusion of the leaves of tea as a beverage is general in the s.e. parts of Asia, and has become prevalent also amongst the British—at home and in all their colonies—the Americans, and the Dutch. In Scandinavia, tea is also much used by all who can afford it. In other parts of Europe the use of tea is much less general, and is chiefly confined to maritime districts, towns, and the wealthy. The importation of tea overland through Russia is inconsiderable, and the sea trade is chiefly to Britain and North America.

The *substitutes* for tea, in countries where it is difficult to obtain it, are of two sorts: those which contain theine, and which consequently have the same stimulating effect; and those which are destitute of that principle, and only resemble the true tea in flavor or smell, or which possess some other stimulating principle. Of the former class are—(1). Maté (q.v.); (2). Guarana (q.v.)—so rich is this material in theine that it has lately been used in this country for obtaining that principle; and it has been introduced into Austria and France as a powerful medicine; (3). Coffee-leaves, which are occasionally prepared as a substitute in the West Indies; they would be more gener-

ally used were it not for the disagreeable smell of the infusion; (4). the kola-nut, the active principle of which was some years ago ascertained to be theine.*

The second class, or those which do not possess that principal, are very numerous; but only a few can be said to be of any importance from being in general use in the countries producing them. These are the Siberian tea—leaves of *saxifraga crassifolia*; the Appalachian tea—leaves of *prinos glabra*; the Labrador tea—leaves of *ledum buxifolium*; the Chilian tea—leaves of *Eugenia ugni*; Trinidad pimento tea—leaves of *Eugenia pimenta*; and the leaves of the partridge-berry, which are used in some parts of North America. The Fahani tea of Mauritius, and a great many more, should be regarded in the light of medicines rather than as ordinary beverages, although they are generally classed as substitutes for ordinary tea.

Tea, in its chemical, physiological, and medicinal relations.—On submitting the ordinary commercial tea to analysis, we find that it contains (1) a volatile or essential oil; (2) theine or caffeine, described in this work under the latter name; (3) a nitrogenous compound analogous to caseine or gluten; (4) a modification of tannin; besides gum, sugar, starch, fat, woody fiber, salts, etc. The volatile oil gives to tea its peculiar aroma and flavor. The proportion in which it exists is, according to Miller, about 0.79 per cent in green, and 0.6 per cent in black tea. It may be obtained by distilling the tea with water, and is found to exert a most powerfully stimulating and intoxicating effect. In China tea is seldom used until it is a year old, on account of the well-known intoxicating effects of new tea, due probably to the larger proportion of essential oil which it usually contains. The headache and giddiness of which tea-tasters complain, and the attacks of paralysis to which, after a few years, persons employed in packing tea are found to be liable, are due to the action of this oil, which according to Johnston, "does not exist in the natural leaf, but is produced during the process of drying and roasting."

Chemistry of Common Life, 1855, vol. i. p. 170.

The theine or caffeine, an alkaloid of weak basic properties, varies considerably in different kinds of tea. Peligot found it to range from 2.2 to 4.1 per cent in ordinary green teas, while very rarely it amounted to 6 per cent; whereas from the researches of Stenhouse it appears that not more than 2 per cent is usually contained in the ordinary teas in the English market. It may readily be obtained by the following simple experiment. When dry finely-powdered tea leaves, or a dried watery extract of the leaves, are put on a watch-glass covered with a paper cone, and the whole is placed upon a hot plate, or exposed to the heat of a spirit-lamp, a white vapor gradually rises and condenses on the interior of the cone, in the form of small crystals, which consist of theine. As it has no odor, and only a slightly bitter taste, it obviously has little to do with the taste or flavor of the tea from which it is extracted; it is, however, to the presence of this ingredient that the peculiar physiological action of tea on the animal economy is due. This substance is represented by the formula $C_8H_{10}N_4O_4 + 2Aq$, and is remarkable for the large quantity of nitrogen (28.83 per cent) which it contains, and which is nearly

*Dr. Daniell's observations on the kola-nut (see the article COLA-NUT) are of such importance as to demand a notice here. From time immemorial the seeds of the kola-nut have been held in inestimable value as a luxury by the inhabitants of the vast tract between the west coast and the region of Central Africa known as Sudan; and the trade in these nuts has extended to various markets on the Mediterranean. The Portuguese, Dutch, and subsequently the English voyagers, fell into the negro predilections for this fruit; and eventually the due gratification of this want became a matter of imperative necessity. Dr. Daniell's knowledge of the tonic and astringent properties of these nuts was gained during his residence on the Gold Coast, where the white inhabitants were in the habit of taking a decoction of the fresh nuts, with apparent benefit, in a particular form of endemic diarrhoea, arising more from local relaxation of the mucous membranes than from constitutional debility. On taking the medicine late, two evenings in succession, when he was afterward suffering from an attack of this kind in Jamaica, he found that he was deprived of sleep during the remainder of the night. On intermitting the decoction, the natural rest returned, and on returning to it, the insomnia again occurred. Hence he was led to suspect that a substance analogous to theine must be present; and a chemical analysis of the nuts yielded crystals in all respects resembling those of theine, and subsequently proved by the more careful investigations of Dr. Atfield to be composed of that alkaloid. Wherever the slave-trade prevailed, the tree yielding the kola-nut (*cola acuminata* of Robert Brown) followed as a matter of necessity, being imported and cultivated for the benefit of the negro. It was thus introduced into the Mauritius, Jamaica, and other West India islands, Brazil, Mexico, etc. It was specially intended to act in warding off the predisposition to epidemic outbreaks of suicidal mania, which not unfrequently almost depopulated considerable districts. While Dr. Daniell's experiments disprove the statement (alluded to in the article COLA-NUT) that these seeds render bad water palatable, his investigations, confirmed as they are by Dr. Atfield's chemical analysis, show, that whatever may be their food-value (which Dr. Daniell estimates higher, from his observations, than Dr. Atfield from their analysis), they may be advantageously substituted for coffee. See the papers by Dr. Daniell, "On the Kola-nut of Tropical West Africa," and by Dr. Atfield, "On the Food-value of the Kola-nut," in the *Pharmaceutical Journal* for March, 1865.

†The following comparative analysis of tea, coffee, and the dry kola-nut, are interesting, as showing in how nearly they contain the same organic constituents, although in different proportions:

100 Parts of tea contain	100 Parts of Coffee contain	100 Parts of Kola- nuts contain
Water..... .5	12	13.65
Theine..... .3	1.75	2.13
Caseine..... .15	13	6.33
Gum..... .15	9	10.67
Sugar..... .3	6.5	
Starch..... a trace	a trace	42.00
Tannin..... 36.25	4	..
Aromatic oil..... 0.75	0.002	1.52
Fat..... .4	12	
Fiber..... .20	35	20.00
Mineral substances..... 5	6.7	3.20

double the amount contained in albumen, fibrine, etc. It is also remarkable as occurring in plants very unlike each other, and growing in remote countries, which have by instinct been selected by different nations for the purpose of yielding a slightly exciting and very refreshing beverage (see above). From numerous experiments, it appears that the introduction into the stomach of a small quantity of theine (such as three or four grains, which is the quantity contained in about one-third of an ounce of good tea) has the remarkable effect of diminishing the daily waste or disintegration of the bodily tissues, which may be measured by the amount of solid constituents contained in the urinary secretion. And if the waste be lessened, the necessity for food to repair that waste will obviously be diminished in an equal proportion. "In other words," says Professor Johnston, "by the consumption of a certain quantity of tea, the health and strength of the body will be maintained in an equal degree upon a smaller supply of ordinary food. Tea, therefore, saves food—stands to a certain extent in the place of food—while at the same time it soothes the body, and enlivens the mind."—*Op. cit.* p. 173. It should, however, be stated, that the generally accepted view, that theine checks the destruction of the tissues, has been recently called in question by an excellent experimental observer, Dr. Edward Smith, in various memoirs published in the *Philosophical Transactions* and elsewhere. If double the above quantity of theine (or of the tea containing it) be taken, there is a general excitement of the circulation, the heart beating more strongly, and the pulse becoming more rapid; tremblings also come on, and there is a constant desire to relieve the bladder. At the same time the imagination is excited, the mind begins to wander, visions appear, and a peculiar kind of intoxication comes on; the symptoms finally terminating, after a prolonged vigil in a sleep arising from exhaustion. It is not definitely known what changes theine undergoes in the animal economy, but when oxidized artificially it becomes decomposed into methylamine or methyllia (C_2H_5, H_2N), hydrocyanic acid (C_2N), and amalic acid ($C_{12}H_7N_2O_5$). The nitrogenous compound allied caseine or gluten constitutes about 15 per cent of the weight of the leaf. As hot water extracts very little of this substance, a large quantity of this nutritious matter, which forms about 28 per cent of the dried spent leaves is thrown away. Much of it might be dissolved if a little carbonate of soda were added to the boiling water with which the tea is made; and in the brick-tea (the refuse and decayed leaves and twigs, pressed into molds) used by the Tartars, most of this substance is utilized. They reduce the tea to powder, and boil it with the alkaline water of the steppes to which salt and fat have been added, and of this decoction they drink from 20 to 40 cups a day, mixing it first with milk, butter, and a little roasted meal. But without the meal mixed only with a little milk, they can subsist for weeks on this thin fluid food. To the astringent principle or tannin, which forms from 13 to 18 per cent of the dried leaf, tea owes its astringent taste, its constipating effect upon the bowels, and its property of communicating an ink-like color to water containing salts of iron. Whether this ingredient contributes in any degree to the exhilarating, satisfying, or narcotic action of tea, is not known. Professor Johnston thinks it probable that it does exert an exhilarating effect, from the fact, that a species of tannin is the principal ingredient of the Indian betel-nut, which, when chewed, produces a mild and agreeable form of intoxication.

It is usual to judge of the quality of a tea by its aroma, and by the flavor and color of the infusion which it yields; but to these tests should be added the determination of the amount of soluble matter which it readily yields to boiling water. It is stated by Miller that our ordinary tea contains about 45 per cent of soluble matter; but the independent researches of Davy and Peligot show that boiling water seldom extracts more than one-third of the weight of the dry tea; while in J. Lehmann's experiments, only one-sixth (15.5 per cent) was extracted. Good tea should, moreover, not yield more than 5 or 6 per cent of ash when incinerated; and a portion of this is probably due to the coloring matter which the Chinese add to the green teas prepared for the foreign market. For this purpose they used to employ a mixture of Prussian blue and gypsum, but indigo is now commonly used, which is probably harmless. Drinkers of green tea who wish to know which of these adulterations they are swallowing, may easily determine the point by the following simple experiment: "If a portion of the tea be shaken with cold water and thrown upon a bit of thin muslin, the fine coloring matter will pass through the muslin and settle to the bottom of the water. When the water is poured off, the blue matter may be treated with chlorine, or a solution of chloride of lime. If it is bleached, it is indigo; if potash makes it brown, and afterward a few drops of sulphuric acid make it blue again, it is Prussian blue."—Johnston, *op. cit.*, p. 181, note.

Much has been written regarding the dietetic and medical uses of tea. While some physicians have over-praised its value, others have regarded it as the source of numerous diseases, especially of the nervous system. In his admirable work on *Hygiene*, Dr. Parkes remarks that "tea seems to have a decidedly stimulative and restorative action on the nervous system, which is perhaps aided by the warmth of the infusion. No depression follows this. The pulse is a little quickened. The amount of pulmonary carbonic acid is, according to Dr. E. Smith, increased. The action of the skin is increased; that of the bowels lessened. The kidney excretion is little affected; perhaps the urea is a little lessened, but this is uncertain, the evidence with regard to the urine being very contradictory." Dr. E. Smith considers that "tea promotes all vital actions." Dr. Parkes regards it as a most useful article of diet for soldiers, and it is well known that cold tea is frequently preferred to beer or cider by sportsmen, reapers, and others

engaged in laborious work in hot weather. As a general rule, tea is very prejudicial to young children, and is not a suitable drink till growth is completed; and adults of an irritable constitution, or a leuco-phlegmatic temperament, often suffer from its use. Those with whom tea does not agree will generally find cocoa the best substitute. Old and infirm persons usually derive more benefit and personal comfort from tea than from any other corresponding beverage. In fevers, tea, in the form of a cold weak infusion, is often of great service. In persons of a gouty and rheumatic tendency, and especially in such as are of the *lithic acid diathesis* (q.v.), weak tea, taken without sugar, and with very little milk, is the best form of ordinary drink. In some forms of diseased heart, tea proves a useful sedative, while in other cases it is positively injurious; and a cup of strong green tea, especially if taken without sugar or milk, will often remove a severe nervous headache. It is nearly as powerful an antidote in cases of opium-poisoning as coffee; and very strong tea has been the means of preserving life, in cases of poisoning by tartar-emetic, the tannin being in these cases the active agent. It is impossible to speak too strongly against the habit occasionally adopted by students of keeping off their natural sleep by the frequent use of strong tea. The persistent adoption of such a habit is certain to lead to the utter destruction of both bodily and mental vigor.

TEA (*ante*). The American tea-trade began in 1784, when the first American ship sailed for China. This enterprise was followed in the next year by the dispatching of two vessels, resulting in an importation, direct, of 880,000 lbs.; and in 1786 five vessels brought more than a million pounds. The first direct importation of Japan tea was made in 1868 from Yokohama to San Francisco. The intervention of steam in the tea-carrying trade occurred first in 1867, when the Pacific mail steamer *Colorado* made a voyage to Hong Kong and Yokohama, and brought back tea to San Francisco. The time now occupied in the transportation of tea from Japan to New York is 30 to 40 days; and from Shanghai to the same port, 40 to 50 days, via San Francisco and the Pacific railroad. During the war of the rebellion there was levied a war-duty of 25 cents per lb. on tea; which was reduced to 15 cents in 1871, and entirely removed in the following year. The following table gives the quantity and value of the tea imported into the United States for the fiscal years ending June 30, 1853-79 inclusive:

YEAR.	POUNDS.	DOLLARS.	YEAR.	POUNDS.	DOLLARS.
1858.....	32,995,021	7,261,815	1869.....	43,751,351	13,687,750
1859.....	29,268,757	7,388,741	1870.....	47,408,481	13,863,373
1860.....	31,696,657	8,915,327	1871.....	51,264,919	17,251,617
1861.....	26,117,956	6,977,283	1872.....	63,811,003	22,913,575
1862.....	24,838,421	6,545,664	1873.....	61,815,126	24,366,170
1863.....	29,761,037	8,013,772	1874.....	55,811,605	21,112,324
1864.....	37,229,176	10,549,880	1875.....	64,856,899	22,673,793
1865.....	19,568,318	4,956,730	1876.....	62,887,153	19,524,166
1866.....	42,992,738	11,123,231	1877.....	58,247,112	16,181,467
1867.....	39,492,658	13,415,037	1878.....	65,366,704	15,660,168
1868.....	37,843,612	11,111,560	1879.....	60,191,673	14,577,618

TEAK, the name of two kinds of timber, valuable for ship-building and other purposes, one of which is known as INDIAN TEAK, and the other as AFRICAN TEAK. The trees which produce them belong to very different orders. INDIAN TEAK (*tectonia grandis*) is a tree of the natural order *verbenaceæ*. It is found in the mountainous parts of Malabar, and elsewhere in Hindustan, and in the Eastern Peninsula, Ceylon, Java, etc. It has been introduced in some parts of India, in which it is not indigenous. Dr. Roxburgh introduced it in the low grounds of the Circars as early as 1790. It has been planted in some parts of Ceylon, but not yet with much result, as it takes 60 or 80 years to grow to a large size. It is a beautiful tree, attaining a height sometimes even of 200 ft., and rising above all the other trees of the East Indian forests. It has deciduous oval leaves of 12-24 in. long, covered with rough points; great panicles of white flowers, with 5-6 cleft corolla, and 4-celled drupes about the size of a hazel-nut. Its flowers are used medicinally in cases of retention of urine, and its leaves by the Malays in cholera. Silk and cotton stuffs are dyed purple by the leaves. The timber is the most valuable produced in the East Indies; it is light and easily worked, strong, durable, and not liable to the attacks of insects. It abounds in silex, and resembles coarse mahogany. It is extensively used for ship-building, for which purpose it is imported into Britain. All the finest ships built in India, and many built in England, are of teak. The most extensive teak forests are in Pegu. The teak generally rather grows in clumps in forests than forms forests of itself.—AFRICAN TEAK, sometimes called AFRICAN OAK, is a timber similar to East Indian teak. It is now believed to be the produce of *Oldfieldia Africana* a tree of the natural order *Euphorbiaceæ*; but the leaves of many different trees have been brought to botanists as those of the African teak.

TEAL, *Querquedula*, a genus of ducks (*anatidæ*) with very slightly lobed hind-toe, narrow bill, as long as the head, the sides nearly parallel, or widening a little at the end, the wings pointed, the tail moderately large, and wedge-shaped. Some naturalists divide the genus into two—*nettion*, in which the bill has parallel sides, and a small nail at the tip; and *querquedula*, in which it is widened, and has a larger nail. The species are numerous, the smallest of the ducks, and widely distributed over the world. They

generally frequent rivers and lakes, feeding principally at night on aquatic insects, worms, mollusks, seeds, etc. The COMMON TEAL (*Q. or N. crecca*) is plentiful in Britain and in most parts of Europe. It is occasionally but rarely seen in North America. Its whole length is about 14 inches. It is a very beautiful bird; the head of the male brownish-red, the body transversely undulated with dusky lines, a white line above, and another beneath the eye, the speculum black and green. It makes its nest on the margins of lakes or rivers, of decayed vegetable matter lined with down, and lays eight or ten eggs. Its flesh is extremely delicate. It was domesticated by the ancient Romans, and seems capable of being advantageously introduced into our poultry yards.—The GARGANEY (q.v.) is another British species.—The GREEN-WINGED TEAL (*Q. or N. Carolinensis*) of North America is very similar to the common teal, but it is at once distinguished by a white crescent in front of the bend of the wings. It is occasionally seen in Europe. In its summer migrations, it visits very northern regions.—The BLUE-WINGED TEAL (*Q. discors*) is very abundant in many parts of North America. It is rather larger than the common teal. It is easily domesticated.

TEANO, a city of Terra di Lavoro, a province of the Sicilies, corresponding to the ancient Teanum. The town lies on the s. slope of the Rocca Monfina, a range of volcanic character; pop. about 13,000. The place is the seat of a bishopric and is interesting from the ruins of an ancient theater and amphitheater, Roman inscriptions, and a castle and cathedral dating from the 15th century.

TEAR PITS. See DEER.

TEARS. See LACHRYMAL ORGANS, *art.*

TEASEL, *Dipsacus*, a genus of plants of the natural order *Dipsacæ* or *Dipsacaceæ*. This order consists of herbaceous and half-shrubby exogenous plants, with opposite or whorled leaves, and flowers in heads or whorls, surrounded by a many-leaved involucre. About 150 species are known, natives of the temperate parts of the Old World. In the genus *Dipsacus*, the flowers are separated from each other by long, stiff, prickly-pointed bracts. The only valuable species of the order is the FULLER'S TEASEL, or CLOTHIER'S TEASEL (*D. fullorum*), a native of the s. of Europe, naturalized in some parts of England. It is a biennial, several feet high, with sessile serrated leaves, the stem and leaves prickly; and with cylindrical heads of pale or white flowers, between which are oblong, acuminate, rigid bracts, hooked at the point. The heads are cut off when the plant is in flower, and are used in woolen factories, and by fullers and stockingmakers, for raising the nap on cloth. No mechanical contrivance has yet been found to equal teasel for this purpose; to which the hooked points, the rigidity, and the elasticity of the bracts are admirably adapted. The heads of teasel are fixed on the circumference of a wheel or cylinder, which is made to revolve against the surface of the cloth. Teasel is cultivated in many parts of Europe, and is imported into Britain from Holland and France. It is cultivated to some extent in England, particularly in Somersetshire and Yorkshire. The seed is sown in March, on well-prepared strong rich land, and the plants thinned out to a foot apart. In August of the second year, the heads are ready to be cut. They are packed in bundles of 25 each, and about 160 such bundles are the usual produce of an acre. The flowers of teasel abound in honey, and the seeds are used for feeding poultry. The root was formerly in use as a diuretic and sudorific.

TEBESSA, a t. in Algeria, province of Constantine; 75 m. s.e. of Constantine. It is entered by two gates, one of which is probably of Roman construction, and in the form of a triumphal arch. The leading buildings are Roman, of which a fortress is still well preserved; a small temple also remains unimpaired, which is now used for soap works. It has an extensive trade in boots, shoes, dates, and hardware.

TECHE, BAYOU, in Louisiana, begins in St. Landry's parish, and after a s.e. course of about 175 m. empties into Atchafalaya bayou. It is navigable for small steamboats as far as St. Martinsville.

TECHNICAL EDUCATION (Gr. *techné*, art) means special instruction and training for the industrial arts. This subject has received much attention of late years in consequence of comparisons drawn between the manufactures of Great Britain and those of other countries shown in the great international exhibitions held in London, Paris, Vienna, and Philadelphia. Some good judges have asserted that owing to the superior training given in continental schools to young persons in the sciences specially bearing on the arts and manufactures, our neighbors are making much more rapid progress than we are. At all events, so much attention is now given to this kind of instruction abroad, that we can no longer afford to run the risk of falling behind in so important a matter. The subject was taken up by the society of arts in London in 1853, a committee of which body reported, after due inquiry, that the want of the technical element was a serious defect in the education of the country. In 1868 a select committee of the house of commons (Mr. Samuelson's) took much evidence, and made a report on this subject recommending that the state aid given to the teaching of science as applied to industry should be increased. Another parliamentary inquiry in the form of a royal commission on the advancement of science took place in 1870, 1871, and 1872, at which a great mass of evidence was given by most of the prominent men of science in the country, and the commission has made several reports on the subject. This inquiry was not specially directed to what we may call the practical sciences, nevertheless much of the evidence bore upon these.

Government aid for the teaching of science to the industrial classes is now given through the science and art department of the committee of council on education, which, in 1859, established a system by which payments on results are given to certified teachers, and prizes to successful pupils. The examination questions are framed by a staff of eminent scientific men, and examinations are held all over the country in May. For a number of years past the subjects have been as follow, with exception of No. 24, which has been recently added: 1, practical plane and solid geometry; 2, machine construction and drawing; 3, building construction; 4, naval architecture and drawing; 5, pure mathematics; 6, theoretical mechanics; 7, applied mechanics; 8, acoustics, light, and heat; 9, magnetism and electricity; 10, inorganic chemistry; 11, organic chemistry; 12, geology; 13, mineralogy; 14, animal physiology; 15, elementary botany; 16 and 17, biology, including animal and vegetable morphology and physiology; 18, principles of mining; 19, metallurgy; 20, navigation; 21, nautical astronomy; 22, steam; 23, physical geography; 24, principles of agriculture. Since 1878 a new subject called physiography has taken the place of physical geography.

The success of this scheme is shown by the great increase (seen in the following table) which has taken place in the number of schools, and pupils that avail themselves of it:

	No. of Schools.	No. of Students.
1860.....	9	500
1866.....	153	6,835
1873.....	1,182	48,546
1876.....	1,484	52,330

The parliamentary grant for payment to teachers on results as respects science, to which the above table alone refers, was in the financial year 1876-77 £50,000, besides a sum of £3,500 for prizes to students, and a further sum of £2,500 for examples, books, materials, etc. About an equal sum was voted for the encouragement of art (chiefly free-hand drawing) in night schools for artisans, and in public elementary schools.

Besides the government scheme of science instruction for artisans, there are a number of private or semi-private institutions where prelections of a technological nature are given. Among the most successful of the older ones are the Watt institution (school of arts) at Edinburgh, and the Andersonian university at Glasgow. The former was established in 1821, and for more than 30 years the principal subjects taught were mathematics, natural philosophy, chemistry, and mechanical drawing. Within the last 20 years other subjects have been added, and the total number of students is now between 1000 and 1500 annually. The evening courses of the Andersonian university, where much the same subjects are taught, are likewise very largely attended by artisans. Colleges for teaching science with special reference to the useful arts, but science of a more advanced character than can easily be taught during evening hours only, have been quite recently established in several localities, such as that of Newcastle, in connection with the university of Durham, the Yorkshire college of science at Leeds, and the college founded and endowed by sir Josiah Mason at Birmingham. Of a high character also is the instruction given in the royal school of mines, London, established in 1851, and the royal college of science in Dublin, both government institutions. The naval and military colleges are essentially of a like nature. At Cirencester there is a fully equipped agricultural college established about 30 years ago. Several of the London corporations are now about to provide technical instruction.

Technical schools have existed for a long time on the continent. Of the more recently organized ones those of Zurich and Carlsruhe are the most extensive. The former is a college and polytechnic school combined, having about 500 students and a large staff of professors. At Carlsruhe, which is simply a polytechnic school, there are 600 students and 40 professors and lecturers. Several polytechnic schools of a high class exist in France, and some have lately been founded in the United States.

The journal of the society of arts, the reports of the science and art department, and the reports of select committee and the royal commission above referred to, contain much interesting information on this subject.

TECHNOLOGY (Gr. *techné*, art) is the name given to the science or systematic knowledge of the industrial arts. In its widest sense, it would embrace the whole field of industry, but it is restricted in usage to the more important manufactures (spinning, weaving, metallurgy, brewing, etc.). Technology is not an independent science, having a set of doctrines of its own, but consists of applications of the principles established in the various physical sciences (chemistry, mechanics, mineralogy, etc.) to manufacturing processes. A complete course of instruction in technology could only be of the most superficial kind. The essential preparation for any branch of the manufacturing arts is the study of the fundamental physical sciences which are taught in schools and universities; and the special applications to the branch which the student has to pursue professionally can best be learned from special treatises on the subject in connection with practice in a manufacturing establishment. A general knowledge, however, of the arts of manufacture is interesting and instructive to all, and hence the museums of industry recently established by the British government, and yet in their infancy, promise to be of great benefit to the public in general, as well as to the manufacturer. See **TECHNICAL EDUCATION**.

TECK, a duchy situated in Swabia during the middle ages. It derived its name from the castle of Teck, the ruins of which are still in existence. The house of Hapsburg gained possession of it in the 11th c., and sold it in the 14th c. to the dukes of Württemberg.

TECTIBRANCHIATA, an order of gasteropodous mollusks, having the gills arranged only on one side, resembling pinnatifid leaves, and covered by the mantle and a small shell. The tectibranchiata feed mostly on sea-weeds, but some of them also eat animal substances. To this order belongs the sea-hare of the Mediterranean (*aplysia depilans*), which is sometimes a foot in length, and was in former times an object of superstitious dread, on account of its grotesque form, and of a violet colored fluid which it ejects from the inner surface of the mantle when molested, and which was supposed to be poisonous.

TECUMSEH, or **TECUMTHA**, about 1768-1813; chief of the tribe of Shawnees; b. near the site of Springfield, Ohio. With his brother, Elskwatawa, who claimed the gift of prophecy, he attempted to form an alliance of all the western tribes against the whites. A village of about 400 warriors was gathered at Greenville, and they were ordered to remove by gen. Harrison, who was then governor of the territory of Indiana. Various hostile movements on the part of Tecumseh's forces led to the battle of Tippecanoe, Nov. 7, 1811. Harrison was at the head of about 800 men, and was attacked by Tecumseh in his own camp. The whites repulsed and defeated the Indians. Before a treaty had been concluded with the tribes, the war of 1812 broke out and Tecumseh allied himself to the British forces. He took part in the battles on the Raisin river and at Maguaga; was wounded in the latter, and made brig.gen. in the British forces for his services. At fort Meigs he showed humanity in his treatment of prisoners. The field of battle at the Thames was selected by Proctor and Tecumseh, the latter commanding the right wing. He was killed while fighting desperately. A life of the great Indian chief was written, 1841, by Benjamin Drake.

TE DEUM (*Te Deum laudamus, Te Dominum confitemur*), a well-known hymn (so called from its first words) of the Roman Catholic church, sung on all occasions of triumph and thanksgiving, and a theme upon which the most celebrated composers have from time immemorial exercised their musical genius. The hymn is one of the most simple, and at the same time the most solemn and majestic, in the whole range of the hymnology of the Roman Catholic church. Its authorship is uncertain. An ancient chronicle (long posterior, however, to the supposed date of the composition of this hymn, and otherwise destitute of authority) describes the Te Deum as the joint production of Sts. Ambrose and Augustine, into which they both burst forth by a common inspiration on occasion of the baptism of Augustine. From this supposed origin, the Te Deum is commonly called the Ambrosian hymn. It is ascribed by other authorities to Hilary of Poitiers, but is most probably considerably later. Besides its general use on occasions of joyous celebrations, the Te Deum forms part of the daily "matins" of the Roman breviary, and is recited at the end of "matins" on all festivals, and on all Sundays except those of Advent and Lent, to which, as being seasons of penance, the Te Deum is considered inappropriate. Its use is very ancient. It is universally admired by Protestants as well as Roman Catholics, and exhibits none of the peculiarities of Roman Catholic theology.

TEEL-SEED. See OILS and RAM-TIL.

TEES, a river in the n. of England, is 90 m. long, flows east, forming the boundary between the counties of Durham (q.v.) and York (q.v.), and falls into the North sea, 10 m. below Stockton, to which town it is navigable for vessels of 60 tons burden.

TEETH, **THE**. A tooth is described by prof. Owen, the highest authority on this subject, as "a hard body attached to the mouth or commencement of the alimentary canal, partially exposed when developed. Calcified teeth are peculiar to the vertebrates, and may be defined as bodies primarily, if not permanently, distinct from the skeleton, consisting of a cellular and tubular basis of animal matter containing earthy particles, a fluid, and a vascular pulp."—*The Anatomy of Vertebrates*, 1866, vol. i. p. 359. "They present," says the same writer, "many varieties as to number, size, form, structure, position, and mode of attachment, but are principally adapted for seizing, tearing, dividing, pounding, or grinding the food.* In some species they are modified to serve as formidable weapons of offense and defense; in others, as aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for transport and working of building materials. They are characteristic of age and sex; and in man they have secondary relations, subservient to beauty and to speech. Teeth are always intimately related to the food and habits of the animal, and are therefore highly interesting to the physiologist; they form, for the same reason, important guides to the naturalist in the classification of animals."—*Circle of the Sciences; Organic Nature*, vol. i. p. 264.

True teeth consist of one, two, or more tissues, differing in their chemical composition and in their microscopical appearances. "Dentine," which forms the body of the tooth, and "cement," which forms its outer crust, are always present; the third tissue, the "enamel," when present, being situated between the dentine and cement. The *dentine*, which is divided by prof. Owen into hard or true dentine, vaso-dentine, and

* Hence the division of the teeth into incisors, or cutting teeth; molars, or grinding teeth; etc.

osteo-dentine, consists, according to that physiologist, of an organized animal basis, disposed in the form of extremely minute tubes and cells, and of earthy particles; these earthy or calcareous particles being either blended with the animal matter of the interspaces and walls of the tubes and cells, or contained in a minutely divided state in their cavities. The tubes and cells contain, besides the calcareous particles, a colorless fluid, which is probably transuded blood plasma, or *liquor sanguinis*, and contributes to the nutrition of the dentine. In hard or true dentine, the *dental tubes* proceed from the hollow of the tooth known as the *pulp cavity*, in a slightly wavy course, nearly at right angles to the outer surface. "The hard substance of the tooth is thus arranged in hollow columns, perpendicular to the plane of pressure, and a certain elasticity results from these curves; they are upright where the grinding surface of the crown receives the appulse of the opposing tooth, and are horizontal where they have to resist the pressure of contiguous teeth. The tubuli, besides fulfilling the mechanical ends above stated, receive the plasma transuded from the remains of vascular pulp, which circulates by anastomosing branches of the tubuli through the dentine, maintaining a sufficient, though languid vitality of the system. The delicate nerve-branches on the pulp's surface, some minute production of which may penetrate the tubuli, convey sensations of impressions affecting the dentine—sensations of which every one has experienced the acuteness, when decay has affected the dentine, or when mechanical or chemical stimuli have "set the tooth on edge;" but true dentine has no canals large enough to admit capillary vessels with the red particles of blood." When a part of the primitive vascular pulp from which the dentine is developed remains permanently uncalcified, red blood is carried by "vascular canals" into the substance of the tissue. Such dentine is called *vaso-dentine*, and is often, combined with true dentine in the same tooth, as, for example, in the large incisors of certain rodents, the tusks of the elephant, and the molars of the extinct megatherium. Another modification of the dentine is when the cellular basis is arranged in concentric layers around the vascular canals, and contains "radiated cells," like those of bone; this is termed *osteo-dentine*, and resembles true bone very closely. The *cement* always corresponds in texture with the osseous tissue of the same animal, and wherever it occurs in sufficient thickness, as on the teeth of the horse or ox, it is traversed like bone by vascular canals. Moreover, when the osseous tissue contains minute radiated cells, precisely similar cells are likewise present in the canal, and constitute its most marked characteristic. The relative densities of dentine and cement vary according to the amount of earthy matter. In the complex grinders of the elephant and some other animals, the cement, which forms nearly half the mass of the tooth, wears down sooner than the dentine. The *enamel* is the hardest of all the animal tissues, and contains no less than 96.4 per cent of earthy matter (mainly phosphate of lime), while dentine contains only 72 per cent, and cement and ordinary bone 69 per cent of earthy matter. The earthy matter is contained in comparatively wide canals, composed of animal membrane of extreme tenuity.

In tracing the teeth upward from their simplest to their most complicated forms, we find a very few examples (solely among fishes—as, for example, the wrasse), in which teeth consist of a single tissue—a very hard kind of non-vascular dentine. Teeth consisting of dentine and vaso-dentine are very common in fishes, the hard dentine being external, and performing the office of enamel. Dentine and cement, the latter forming a thick outer layer, constitute the grinding teeth of the dugong. In the teeth of the sloth, the hard dentine is reduced to a thin layer, and the chief bulk of the tooth consists of vaso-dentine internally, and a thick crust of cement externally. "The human teeth and those of the carnivorous mammals appear at first sight to be composed of dentine and enamel only; but their crowns are originally, and their fangs are always covered by a thin coat of cement. There is also commonly a small central tract of osteo-dentine in old teeth. The teeth called compound or complex in *mammalia* differ as regards their composition from the preceding only by the different proportion and disposition of the constituent tissues. Fig. 1 is a longitudinal section of the incisor of a horse; *d* is the dentine, *e* the enamel, and *c* the cement, a layer of which is reflected into the deep central depression of the crown; *s* indicates the colored mass of tartar and particles of food which fills up the cavity, forming the 'mark' of the horse-dealer."—*Organic Nature*, vol. i p. 267. Far more complex forms of teeth than this may be produced by peculiar arrangements, chiefly inflections, of the tissues. Certain fishes, and a family of gigantic extinct batrachians, to which Owen has, from this remarkable peculiarity, given the name *labyrinthodonts* (q.v.), exhibit this kind of complexity in a remarkable degree. Another kind of complication is produced by an aggregation of many simple teeth into a single mass. These compound teeth are most common in fishes, but are occasionally met with in mammals. The teeth of the Cape ant-eater (*orycteropus*), depicted and described by Owen in *The Circle of the Sciences*, are of this kind, each tooth being composed of a congeries of long and slender prismatic denticles of dentine, which are cemented together. In the ele-

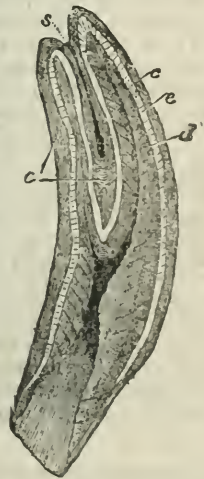


FIG. 1.—Longitudinal section of the incisor of a horse.

phant, the compound molars belong to this class, the denticles being in the form of plates vertical to the grinding surface, and transverse to the long diameter of the tooth. When the tooth is bisected vertically and longitudinally, the three substances, dentine, cement, and enamel, are seen blended together.

Our limited space forbids our entering into any details regarding the teeth of fishes, further than to remark that, in regard to their number, form, substance, structure, situation, or mode of attachment, they offer a greater and more striking series of varieties than do those of any other class of animals. In all fishes, the teeth are shed and renewed, not once only, as in mammals, but frequently during the whole course of their lives; and, as prof. Owen observes, "this endless succession and decadence of the teeth, together with the vast numbers in which they often co-exist in the same fish, illustrate the law of vegetation or irrelative repetition, as it manifests itself on the first introduction of new organs in the animal kingdom." While comparatively few fishes are entirely devoid of teeth, we find that in the class of reptiles, the whole order of *chelonina* (tortoises and turtles), the family of toads (*bufonidae* in the order of *batrachia*), and certain extinct genera of *sauria* (lizards) are toothless. Frogs have teeth in the upper, but not in the lower jaw. Newts and salamanders have teeth in both jaws and upon the palate; and teeth are found on the palate as well as on the jaws of most serpents. In most lizards, and in crocodiles, the teeth are confined to the jaws. The teeth in reptiles are for the most part simple, of a conical form, and adapted, as in the case of most fishes, for seizing and holding, but not for dividing or masticating the food. In no reptile does the base of the tooth branch into fangs; and, as a general rule, the base of the tooth is ankylosed to the bone which supports it. The completion of a tooth is soon followed by preparation for its removal and succession, the faculty of developing new tooth-germs being apparently unlimited in this class. For further details regarding the teeth of fishes and reptiles, the reader is referred to prof. Owen's invaluable *Anatomy of the Vertebrates*, 1866, vol. i. pp. 359-409. Birds having no teeth, we proceed to the consideration of the dental system of mammals—a class which includes a few genera and species that are devoid of teeth. The true ant-eaters (*myrmecophaga*), the pangolins or scaly ant-eaters (*manis*), and the spiny monotrematous ant-eater (*echidna*), are strictly toothless. The ornithorhynchus has horny teeth, and the whales (*balena* and *balanoptera*) have transitory teeth, succeeded in the upper jaw by whale-bone. The female narwhal exhibits nothing more than the germs of two teeth in the substance of the upper jaw; in the male, one of these germs becomes developed into the remarkable weapon which specially characterizes the animal, and to which its generic term *monodon* (single tooth), is due. In the great bottle-nose whale, in the adult state, there are only two teeth (here occurring in the lower jaw); whence the name *hyperoodon bidens*. The elephant has never more than one entire molar, or parts of two, in use on each side of the upper and lower jaws; to which are added two tusks, which are modified incisors, more or less developed, in the upper jaw. Some rodents have two grinders on each side of both jaws, which, added to the four cutting-teeth in front, make 12 in all; but the common number of teeth in this order is 20, although hares and rabbits have 28 each. The number of teeth, 32, which characterizes man, the apes of the old world, and the true ruminants, is the average one of the class mammalia; but according to prof. Owen, "the typical number is 44." "I have been led," he observes, "chiefly by the state of the dentition in most of the early forms of both carnivorous and herbivorous mammalia which flourished during the eocene tertiary periods, to regard three incisors, one canine, and seven succeeding teeth on each side of both jaws, as the type-formula of diphodont* dentition."—*On the Classification and Geographical Distribution of the Mammalia*, 1859, p. 18. A few of the monophodonts possess from 80 to 100 teeth. See the article MAMMALIA. The hog, the mole, the gymnure, and the opossum, are among the few existing quadrupeds which retain the typical number and kinds of teeth. The formula expressing the number of the different kinds of teeth—viz., the incisors or cutting-teeth, the canines or dog-teeth, the premolars, and the molars or true grinder, commonly known as the *dental formula*, is described in the article DENTITION, in which the *milk* or *deciduous* teeth, and the order in which they appear, are also described. It is only in the mammals that we have a well-marked division of the teeth into the four kinds of incisors, canines, premolars and molars, each of which claims a brief description.

The *incisors*, or cutting-teeth, are situated in front, and possess a single conical root or fang, and a vertical crown beveled behind, so as to terminate in a sharp cutting edge. These teeth are specially fitted, as their name implies, for cutting the food. In man, there are two of these incisors in each side of each jaw. In herbivorous animals, they crop the herbage; in rodents (the rabbit, hare, rat, beaver, etc.), these teeth are very much developed, and differ from any other teeth occurring in mammals in this respect, that their growth continues throughout life; and if their length does not con-

* Professor Owen divides the class mammalia, in regard to the times of formation and the succession of their teeth, into the *monophodonts* (Gr. *mono-*, once; *phy-*, generate; and *odont*, tooth), or those that generate a single set of teeth, as the sperm whales, dolphins, porpoises, armadillos, and sloths; and the *diphodonts* (derived from *di*, twice, etc.), or those that generate two sets of teeth, as the mammals generally, with the above exceptions.

stantly increase, it is because their free extremity or edge is worn down by trituration as fast as they grow at the base from their roots.

The *canines* (so called from their prominence in the dog) come next to the incisors. Their crown is rather conical than wedge-shaped, and their fang sinks more deeply into the jaw than in the case of the incisors. In all carnivorous animals, they are largely developed, being obviously formed for tearing the flesh of their prey. In man, there is one canine tooth in each half-jaw; and there is never more than this number in any of the lower animals.

The *premolars* (known also as bicuspid and false molars) come next in order to the canines; they are smaller than the latter, and their crown presents two pyramidal eminences. In man, there are two premolars in each half-jaw. Their function more nearly approaches to that of the true molars behind them, than to that of the canines.

The *true molars* (or multicuspid) are placed most posteriorly. They are remarkable for their comparatively great size, the square form of the upper surface, on which are from three to five elevations or cusps, and for their short root, which is divided into from two to five branches, each of which is perforated at its extremity. In man there are three molars in each half-jaw, the posterior one being termed the wisdom-tooth from its being cut the latest; they are especially employed for grinding the food, under the action of the muscles of the lower jaw.

The teeth are so admirably adapted for the special purposes which they are called upon to fulfill, that it is generally easy, from a careful examination of them, to say to what class of animals they belong, and to draw various conclusions regarding the habits and structure of the class generally. Thus, in carnivorous animals, the molars are not grinding teeth, but present sharp cutting edges, and those of the upper and lower jaw overlap each other; resembling a pair of scissors in their action. In insectivorous animals, the molars have a tuberculated surface, with conical points and depressions, so arranged as to look into each other. In frugivorous animals, living on soft fruits, these teeth are provided with rounded tubercles, while in herbivorous animals, they have a broad, rough surface, resembling a millstone.

There is also a close connection between the articulation or joint of the lower jaw and the nature of the food used by the animal. Thus, in purely carnivorous animals, in which the teeth simply tear and cut the food, no grinding motion is required, and the jaw is capable only of a simple hinge-motion in the vertical plane; while in herbivorous animals, the joint is so constructed as to allow of extensive sliding and lateral motion of the lower molar teeth upon the upper. In man, both the form of this articulation and the general character of the teeth point to an intermediate position in relation to food, and form a good physiological argument for the mixed diet which general custom has decided to be most favorable and natural to our species.—For further information on this subject, the reader is referred, not only to the three works of the professor from which quotations have been made in this article, but to his splendid *Odontography* (1844), and to his article "Teeth," in *The Cyclopaedia of Anatomy and Physiology*; to F. Cuvier, *Sur les Dentes*, etc., and to De Blainville's *Osteographie*.

DISEASES OF THE TEETH.—The dangers to which infants and children are exposed during the process of teething, are noticed in the article DENTITION; and we shall therefore here confine our remarks to the affections of permanent teeth, of which the following are the most important:

1. *Caries of the teeth*, usually commences in the dentine immediately below the enamel, a yellow or brown spot being observed on the surface of the tooth over the affected part. The tissue soon becomes softened, and a small cavity is formed, which, after a time, presents an external opening, in consequence of the unsupported enamel giving way. The substance of the tooth now decays more rapidly, and the caries gradually approaches the central or pulp cavity, which at length is opened. Hitherto, there has been little or no suffering, but now pain is experienced under the action of irritant substances, heat, cold, etc. Inflammation proceeding to suppuration takes place; the pulp is gradually destroyed by ulceration; and the body of the tooth, thus deprived of its nourishment, decays and leaves nothing but the outer coating of enamel, which then breaks away by degrees, till nothing but the fangs of the tooth remain, and these usually cease to give pain. Caries is not only a common cause of toothache, but frequently gives rise to obstinate headache, pain in the ear, deafness, squinting, impossibility of bearing the light (photophobia), and other anomalous symptoms, which immediately disappear upon the removal of the diseased tooth. In these cases, the tooth may never have ached, but will be found painful when pressed up or smartly struck. The primary cause of caries is constitutional, and it especially occurs in scrofulous and ill-nourished persons, or in those whose health is broken down by too frequent pregnancies, prolonged lactation, the abuse of mercury, etc. The direct or exciting causes are usually described as: (1) Such as destroy the integrity of the enamel, and thereby expose the dentine to the influence of irritant substances; or (2) such as operate upon the vital susceptibilities of the dental tissues. Among the former are acids and other corrosive substances taken into the mouth, sour eructations, the attrition of opposing surfaces of the teeth, and all kinds of mechanical violence; while among the latter may be mentioned hot and cold drinks, especially when taken in quick alternation. The excessive use of sugar is also commonly regarded as a cause of the disease. Many of the best dentists,

however, deny that acids (when taken medicinally) or the abrasion of the enamel can give rise to caries.

With regard to treatment, it may be observed that if the caries be slight and recent, the decayed portion must be removed, and the cavity filled up with gold, as described in the article DENTISTRY. "But," says Dr. Drnitt, who on dental matters always quotes the opinion of Mr. Tomes, one of the greatest scientific authorities on the diseases of the teeth, "if the decay has advanced far toward the pulp cavity, or has laid that open, it may be necessary first to employ aperients and tonics, and use some application to deaden the sensibility of the tooth, so as to enable it to bear the stopping, and to protect it meanwhile from contact with food and saliva." Many a useless visit to the dentist might be avoided, if the patient would take an aperient dose of epsom salts two or three consecutive mornings; and after cleansing out the cavity with dry cotton-wool, would insert twice a day a plug of that substance, moistened in eau de cologne, or still better, in either of the following solutions: (1) Mastic solution, formed by dissolving a dram of mastic in an ounce and a half of eau de cologne; or (2) Ethereal tincture of tannin, formed by dissolving a dram each of tannin and mastic in an ounce and a half of sulphuric ether. By these means a painful tooth may be often brought into a state in which it will bear stopping. The patient's sensations will warn him against drinking very hot or cold, or sweet or acid fluids, and against exposure to cold draughts of air. Whenever the teeth exhibit a tendency to rapid decay, general tonic treatment is indicated.

2. *Necrosis* is an affection which is characterized by blackness of the tooth and looseness in its socket. It may be caused by violence, accompanied with destruction of the nutrient vessels, or by inflammation of the pulp. If the tooth gives trouble, it must be extracted. Necrosis of the teeth is quite distinct from the very destructive necrosis of the dental alveolar processes and of the jaws generally, which results from the poisonous action of phosphorus fumes, or from the very similar affection which sometimes follows the eruptive fevers. For an account of the singular and terrible disease from which artisans employed in making lucifer-matches suffer, in consequence of their inhaling the fumes of phosphorus (probably in the form of phosphorous acid), which was first noticed in 1839, we may refer to a review of Von Bibra and Geist's exhaustive treatise (in German) on the subject in the *British and Foreign Medico-chirurgical Review* for April, 1848; and to an article on "Phosphorus Workers" in the fifth report of the medical officer of health. Reference is also made to the disease in the article PHOSPHORUS in this work. The necrosis and exfoliation of the alveolar processes and portions of the jaws in children, consequent upon the eruptive fevers, is accompanied by the shedding of the teeth; and according to Mr. Salter, surgeon-dentist to Guy's hospital, who was the first to describe its true nature, is essentially the same as the necrosis in phosphorus-poisoning, and, like it, is the result of the local application of a specific poison, generated within the individual, to the vascular parts of the teeth. For a description of this remarkable disease, and of the treatment to be adopted, we must refer to Mr. Salter's article on "Exanthematous Jaw-necrosis," in Holmes's *System of Surgery*.

3. *Alveolar abscess* may be defined as a suppuration around the fang or fangs of a tooth, usually carious, accompanied by absorption of the bony walls of the alveolar process, and enlargement of the little sac of pus or matter, which gradually makes its way to the surface, "either along a canal by the side of the fang of the tooth opening at the edge of the gum, or through the gum itself at a point corresponding to the end of the root (or roots) of the tooth implicated. When, however, the fangs are unusually long, or the reflection of the mucous membrane from the gum to the cheek or lip is very superficial, this same discharge may burrow still more outwardly, and find its exit upon the surface of the face."—Salter, *op. cit.*, p. 2. When the discharge bursts, as it most commonly does, through the gum, the alveolar abscess is reduced to its simplest form, and is known as a *gum-boil*. When the discharge takes place in the region of the cheek or chin, the true nature of the case may easily be mistaken by a careless surgeon, who might refer the symptoms to bone-disease. The cause of this affection is either caries or necrosis. In its earliest stage the disease may be cut short by the extraction of the affected tooth, or even by the removal of the stopping, if the tooth is a stopped tooth. If it is desirable to save (for appearance's sake or otherwise) a threatened tooth, the gum should be freely leeched, and hot fomentations applied to the swollen part of the face, and the system should be briskly purged. As soon as matter can be detected it should be allowed to escape by a puncture made through the gum—an operation which is followed by immediate relief, and by rapid subsidence of the swelling, although pus continues to be discharged for a considerable time. Indeed, the disease seldom ceases altogether till the offending tooth is removed. When the abscess shows symptoms of pointing on the face, the tooth must be at once extracted, and more serious surgical interference will probably be necessary.

4. *Toothache* is not so much a disease as a symptom of various morbid states of the affected part, which, for convenience, may be classed under this single heading. "Toothache," says Dr. Wood, "offers every possible variety in degree, character, and duration. The pain runs through all the grades which intervene between a slight sensation of uneasiness and unsupportable agony. It may be dull, aching, heavy, sharp, pungent, throbbing, grinding, or lancinating. It may be continued or paroxysmal, remittent or intermittent, and regular or irregular in its recurrence. It may come in

flashes, and as suddenly disappear; or may continue a long time with little variation."—*Practice of Medicine*, 4th ed. vol. 1. p. 512. According to the various conditions which give rise to it, toothache may be divided into: (a.) *Inflammatory toothache*, which is almost always dependent upon caries. The inflammation may be seated in the pulp of the tooth, in the nerve-twist entering the pulp-cavity, or in the periosteum investing its roots, and reflected over the interior of the alveolar cavity. There is generally some external swelling after the pain has continued for some time, and it occasionally extends to the salivary glands. The tooth is at the same time very tender, and any force applied to it aggravates the pain, which is also increased by hot and cold liquids taken into the mouth. When, as in the great majority of these cases, the pain is associated with caries, the best treatment is as follows: "Let the patient have a dose of calomel and colocynth; confine him to spoon diet; let him wash out the mouth with a solution of carbonate of soda in tepid water; let the gum around the tooth, and between it and its neighbors, if tumid and tender, be deeply scarified with a fine lancet; then let the cavity be filled loosely with a little bit of cotton-wool, dipped into the solution of tannin and mastic (for which the formula has been already given); and if the toothache be curable at all, this plan, with a little patience, will be almost sure to succeed. If the pain is very violent, half a grain of powdered acetate of morphia may be taken up with the cotton imbued with the tannin, which should be warmed before it is put into the cavity. As soon as the pain is relieved, the tooth, if of use, should be stopped with gold or amalgam; or if of no use, it should be extracted. It may be added that most of the violent, burning, empirical nostrums, such as creosote, oil of thyme, etc., although they may be of service when introduced in small quantity by a skilful hand into the carious tooth at the right time, can do nothing but mischief when employed indiscriminately, as they are by the vulgar."—Druitt's *Surgeon's Vade-mecum*, 8th ed. p. 458. (b.) *Neuralgic toothache* may occur either in sound or in carious teeth. It may be recognized by its occurrence in paroxysms at more or less regular intervals, and by its being attended with little or no swelling of the external parts. It is very common in the earlier months of pregnancy, and in persons of a general neuralgic tendency, and is often excited by changes in the weather. The treatment is the same as for neuralgia generally. After the bowels have been freely opened, chalybeates and quinine must be given in large doses, and frictions with veratrina or tincture of aconite (both of which are energetic poisons) may be carefully applied to the gum. (c.) *Rheumatic and gouty toothache* may occur in sound or in carious teeth in rheumatic or gouty persons. The constitutional treatment applicable to these diseases must be tried, together with the local applications already noticed.

5. *Failing of the teeth*, due to absorption of the socket, may be regarded as almost an ordinary consequence of old age; but it frequently occurs under the popular name of *scurvy of the gums* in middle age, although very seldom before the 30th year. True, scurvy, gangrene of the mouth, or mercurial inflammation of the gums, may cause the loosening of the teeth at any age; but there are two other conditions which lead to the same result. In one of these affections, the gums swell, and assume a deep red color, and the inflammation appears to be propagated into the alveoli, producing a thickening of the periosteum, and a consequent elevation of the tooth above its ordinary level. By frequently recurring attacks of this inflammation, the tooth is lifted out of its socket, while the gum retreats from the neck, and leaves a portion of the roots exposed. The tooth thus deprived of its support at length falls, after which the gum heals, and the patient is relieved. The remedies indicated are those tending to relieve inflammation of the gum, but they are seldom successful. In the other affection, there is conjoined suppuration of the gums and sockets, and the disease first shows itself by an oozing of pus from behind the edges of the gums when they are pressed. From the absorption of the sockets, and the simultaneous retreat of the gums, the teeth, as in the previous case, at length fall out, if they have not, for the patient's comfort, been previously extracted. Little can be done in the way of treatment in this form of the affection.

6. *Painful and difficult eruption of the wisdom-teeth* requires a few remarks. The cutting of these teeth is often accompanied by distressing symptoms, which may be protracted for months, or even years, unless surgical aid is called in. The difficulties "arise from the position occupied by these teeth, so close to the joint of the lower jaw, where the mucous membrane is reflected from the gums to the cheek and fauces; combined with the very common condition, that the jaw is not sufficiently elongated backward to allow the *dentes sapientie* to range in the horizontal series with the other teeth." This mechanical difficulty not only holds back these teeth in their bony bed, but it often prevents their proper direction of growth. As a consequence of these displacements in the upper jaw, it often happens that when the jaws are brought together, a bit of mucous membrane is nipped and pinched, leading first to ulceration and extreme tenderness, and subsequently to cicatrization and stiffness of the parts. From insufficient room in the lower jaw the crown only partially emerges through the gum, the first cusp coming through it, while the hinder cusps remain covered. This produces a terrible pinching of the mucous membrane over the tooth every time the jaws are brought in contact. Another troublesome symptom, often associated with the painful cutting of a lower wisdom-tooth, is spasmodic but continuous contraction of the masseter muscle, so as to keep the jaws nearly closed, and capable of only slight separation. The most distressing

result, however, is the suppuration that often attends the difficult eruption of the tooth. Even in ordinary cases, when none of these complications are present, there is often a good deal of diffuse and erratic pain in cutting a wisdom-tooth. It is unnecessary to enter into the treatment, which must be left entirely to the surgeon-dentist.

7. *Hemorrhage after extraction of teeth* has occasionally proved fatal, and is not very unfrequently a troublesome and even dangerous complication of the operation. In most of the recorded cases, there has been distinct evidence of the existence of the hemorrhagic diathesis, or, in other words, of a liability to bleeding profusely from the most trivial wounds. No better local treatment can be recommended than that which was suggested by John Hunter nearly a century ago. "In general, it will be sufficient to stuff the socket with lint, or lint dipped in oil of turpentine, and to apply a compress of lint or a piece of cork thicker than the bodies of the adjacent teeth, so that the teeth in the opposite jaw may keep up a pressure." Matico and saturated alcoholic solution of tannin may be equally efficacious as styptics, but are not superior to oil of turpentine. In some cases, the extracted tooth has been successfully replaced as a plug. The internal administration of astringents, such as tannin and oil of turpentine, should be combined with the local treatment.

8. The subject of *tartar* on the teeth has been considered in a separate article.

TEFF. See MEADOW GRASS.

TEFSA, **TADLA**, or **TEDLA**, a t. of Morocco, 135 m. n.e. of the city of that name, stands in the fertile, well-peopled district of Tadla, on the banks of the Um-er-Beg. It is one of the oldest towns of the country, and its manufactures of woolen cloths and shawls are important. • Together with the small town or suburb of Efza Tefsa contains 10,500 inhabitants, 2,000 of whom are Jews.

TE'GEA, an ancient city of Arcadia, Greece, said to have been founded by Tegeus, son of Lycaon. The inhabitants were noted for their courage, and were subdued by the Spartans only after a prolonged warfare. From Tegea came 3,000 soldiers to the battle of Platea and disputed the place of honor with the Athenians. They supported the Spartans in the Peloponnesian war, but after the battle of Leuctra joined the league, the formation of which brought on war with Sparta. The city resisted the attack of Lycurgus, but was captured by Machanidas, and afterward retaken by Philopæmen. A good account of the place is given by Pausanias. Its ruins are to be found near the modern town of Tripolizza.

TEGNER, **ESAJAS**, a Swedish poet of high reputation, was born in 1782 at Kyrkerud, in the Swedish province of Wernland, and educated at the university of Lund, where he took the degree of M.A. in 1802. In 1805 he was appointed sub-librarian to the university, and lecturer on æsthetics. In 1811 the academy prize was awarded to Tegner's poem of *Svea*, or Sweden, which at once raised him to the rank of one of the most popular writers of his country. Prior to the appearance of this successful poem, he had written several spirited war-songs and national odes, which had attracted the favorable notice of the king and government. In 1812 he became professor of Greek, and at the same time was ordained to the pastoral care of the parish of Ståfje. During the next 10 or 12 years of his life, he devoted himself to the prosecution of his clerical duties, and the acquisition of theological learning, with an earnest and unwearying zeal which was scarcely to be expected from his previous indulgence in the pleasures of society, and his natural inclination toward the exhibition of a taste for coarse humor and equivocal puns. During this period, he composed his two famous religious idyls of *Prestrigelsen*, or the "Consecration of a Priest," and *Nattvardsbarnen*, or "The Young Communicants," and wrote his *Azel*, a poetic romance, which is regarded by some Swedish critics as even superior to his *Frithiof's Saga*, of which the first cantos appeared in a literary journal, edited by the historian Gejer, under the title of the *Iduna*, and conducted under the auspices of the Gothic society, the leading object of which was to foster national literature, and put down the prevalent taste for the pedantic classical or foreign school of writing. In 1825 Tegner published the closing parts of *Frithiof's Saga*, which rather errs in the opposite direction, and follows too closely the ancient saga on which the tale is founded. But notwithstanding the inharmonious character of the composition, which may be regarded rather as a collection of many ballads and odes in various meters than as a complete epic, the *Frithiof's Saga* became the most popular poem of Sweden, and attracted to its author the admiration and notice both of his fellow-clergy and of the sovereign, as was evinced in 1824 by the clergy of the diocese of Wexio nominating him for the vacant bishopric, and the king at once appointing him to the see. In his place at the diet, as a member of the chamber of the clergy, he made himself conspicuous for his support of ultra-conservative views, in opposition to the extreme liberal doctrines which he had advocated in early life. His speeches in the chamber and on numerous other public occasions have a great reputation in Sweden and Norway, and are devoted to the discussion of questions of education, literature, and finance. In 1839 Tegner was proposed for the archbishopric of Upsala; but in the following year, he was seized with unmistakable symptoms of insanity, which had been strongly manifested in two of his brothers and other members of his family. Although, after a few months' confinement in an asylum, he was able to return to his work, his health soon broke down; and after lingering for many months in a paralytic condition, he died in 1846. His collective

works were edited by his son-in-law, prof. Böttiger, and published in 6 volumes (Stock. 1848). All his larger and more popular poems have been translated into German, French, and English; the English translations of his *Frithiof* are very numerous, three or four new ones having appeared between 1873 (Spalding's) and 1879. Lorgfellow's is well known.

TEGUCIGALPA, a t. of Honduras, Central America, is situated on a table-land 3,426 ft. above the sea, 25 m. s.e. of Comayagua. Tegucigalpa is the largest and finest city in the state. In the vicinity are gold, silver, and copper mines; and in the n.w. of the dep. of which Tegucigalpa is the capital, is the mountain of Agalteca, a vast mass of pure magnetic ore. Pop. 12,000.

TEHA'MA, a co. in n. California; drained by the Sacramento river, and by Antelope, Red, Cottonwood, Beaver, and other creeks; traversed by the Oregon division of the Central Pacific railroad; about 2,500 sq.m.; pop. '80, 9,302—7,558 of American birth. The surface between the offshoots of the Sierra Nevada in the e., and the Coast range in the w., is a plain, without timber. The soil in the central parts is fertile. The principal productions are corn, barley, wheat, wool, live stock, and wines. Co. seat, Red Bluff.

TEHRAN', frequently spelled TEHERAN, capital of Persia, and of the province of Irak-Ajemi, 70 m. s. of the shore of the Caspian sea. It stands on a wide plain, dotted here and there with mud-built villages, and pierced with many circular pits, which reach down to the great subterranean water-courses, on which, in this region, the life of animal and plant is altogether dependent. On the n.e. runs the lofty range of the Elburz mountains, rising in Demavend to the height of 22,000 ft. above sea level, and giving dignity to an otherwise tame and unattractive scene. The town is built almost entirely of mud-houses, packed within a mud-wall 20 ft. high, and 4 m. in circumference. The principal buildings are the British and Russian residencies; the bázár of Taki Khan, finished in 1850-51, at a cost of £30,000; the ark, or citadel—in the suburbs—is the shah's palace, and about 2½ m. n. of these, the castle of the Kajars (Kasr-i-Kajar), the "Windsor" of the Persian rulers. Carpets are manufactured; but the chief trades are shoemaking and the manufacture of hats and linen goods. Several telegraph lines have been recently constructed, which center at Tehran; and they have compelled a number of European engineers and telegraph clerks to reside in Tehran, the number of European inhabitants in 1872 being estimated at about 50. Pop. in summer, 80,000; in winter, 120,000.—In the vicinity of Tehran are the ruins of Rei, the *Rhages* of Scripture, known in the time of Alexander the great under the name of *Rage*, and the birthplace of Harûn-al-Raschid.—See Eastwick, *A Diplomat's Residence in Persia* (2 vols. Lond. 1864); *History of Persia*, by Clements R. Markham (1874).

TEHUANTEPEC', a river-port of the s. of Mexico, in the territory of the same name, and 10 m. above the mouth of the river Tehuantepec, in the bay also of that name. The inhabitants, 15,000 in number, are engaged in manufacturing salt and cotton fabrics, and in indigo-planting. Pearl-fishing is carried on, and a purple dye is procured from a shell-fish which abounds in the vicinity.

TEHUANTEPEC' CANAL. See INTEROCEANIC SHIP CANAL.

TEHUANTEPEC', ISTHMUS OF, that geographical division of Mexico which extends between the gulf of Mexico and the Pacific ocean, in an e. and w. direction, and includes the political divisions Vera Cruz and Oaxaca. It comprises the Atlantic plains, which lie along the foot of the Cordilleras, on the gulf; the central mountainous districts; and the Pacific plains on the west. The basin of the Cootzacoalcos, and the contiguous territory, on the e. is a highly fertile alluvial country. This river rises in the Sierras, is navigable 30 m. from its mouth; and is important as offering one of the means for the projected canal connection with the Pacific. The Pacific plains average about 20 m. in width, descending gradually from the mountains. The population of the isthmus, principally Indians and half-breeds, numbers about 62,000; its productions are maize, coffee, cocoa, indigo, cotton, sugar, and tobacco. On the gulf side there are extensive forests of mahogany, cedar, gum, and india-rubber trees. On the western plains are great herds of cattle. The city of Tehuantepec on the river of the same name—which is merely a mountain torrent, thus dignified—is the second town in importance in the state (Oaxaca), and has about 13,000 Indians and half-breed inhabitants, with a few Spaniards. It is situated 11 m. from the Pacific; contains 16 churches, one of which was built by the last Zapoteco cacique in 1530, and possesses manufactures of pottery, cotton, shoes, hats, saddlery, etc. A portion of the isthmus was carefully surveyed by Cortes, who was seeking for an opening to the South sea—the great *desideratum* of the early Spanish navigators to America. Cortes, in fact, was the first to conceive of a method for connecting Asia with western Europe, *via* this isthmus. See INTEROCEANIC SHIP CANAL.

TEI'DE. See MONITOR.

TEIGITUR, one of the service-books of the Catholic church. It is properly but an extract from the Roman missal, and contains the canon of the mass, and certain other portions of the liturgy which do not vary with the variety of festivals or of the ecclesiastical seasons, but are always the same. It is so called from the first words of the

canon, *Te Igitur, Clementissime Pater*. This service-book, as distinct from the missal, was used, and is still used by bishops, prelates, and other dignitaries; and as the "canon" is the most sacred part of the service, oaths upon the *Te Igitur* were regarded as especially solemn. The *Te Igitur* appears to have been used as the ordeal "of compurgation."

TEIGNMOUTH, a sea-port market t., and favorite watering-place on the s. coast of Devonshire, on the n. side of the estuary of the Teign. In front, on the sea-side, is the wide esplanade known as the *den*, formed of a huge bank of sand, accumulated in the course of ages at the river's mouth—one of the chief features of the place. The harbor is safe and commodious, though difficult of entrance, the channel of the river being obstructed by a shifting bar of sand. The chief imports are coal and culm; the exports, granite from Dartmoor, and china-clay; there is also a considerable sea and river fishery. Teignmouth is connected with Shaldon, on the other side of the river, by a wooden bridge (completed in 1827) of 34 spans, 1671 ft. in length, with a swing over the main channel for the passage of ships. A large convent and educational establishment, founded by Miss English, was completed in 1865. The climate is mild and salubrious, and the country around beautiful. It is a station on the South Devon railway. Pop. '71, 6,751.

TEINDS, the name given in the law of Scotland to tithes (q. v.). In Scotland tithes were only paid from the produce of land or cattle. The teinds of corn, called *decimæ garbales*, greater teinds, or parsonage teinds, were generally exigible from all landed property, and originally paid to the rector or parson serving the cure, a small portion being claimed by the bishop. The tithe of the produce of animals, as wool, milk, cheese, was called lesser teind, or vicarage teind, because, where due, it was paid to the vicar; but vicarage teind was only legally exigible where a usage of paying it could be shown. The teinds, supposed to be due at common law to the incumbent of the parish, had, previously to the reformation, been largely diverted elsewhere (see *COMMENDATORS*); in some instances, they had been bestowed on some favorite religious house by the patron, who seemed to consider himself their absolute proprietor; in others, they had been feued to some layman. In many cases the religious house which had acquired the teinds, profited, or at least saved itself from odium, by selling them to the crown, or to a lay subject; and not unfrequently the pope, who was viewed as patron of all benefices to which no one else could claim a right of presentation, granted to the lands of churchmen an exemption from the payment of teind. At the reformation, the church-lands were claimed by the crown; those that had belonged to the religious houses were erected into temporal lordships, whose proprietors, called *lords of erection*, or *titulars*, were nominally burdened with the support of the clergy, by salaries modified out of a third part of the benefices. At the majority of James VI., it was found advisable to check the practice of granting the lands of religious houses to laymen; and the church lands were declared, with certain exceptions, to be inalienably annexed to the crown.

The right to tithes was, in Scotland as elsewhere, originally made effectual by their owner drawing the *ipsa corpora*, separating every tenth sheaf after the crop was reaped. But this proceeding often became an instrument of oppression, as the proprietor was obliged to allow his crop to remain on the ground exposed to all the vicissitudes of the season, until the beneficiary chose to draw his teind; and prior to the reformation, agreements had become common by which a certain quantity of grain, called *rental bolls*, was accepted in full value of teind, while leases were sometimes granted of the teinds for a money payment.

Various not very successful attempts were made during the reign of James VI. to regulate the conflicting interests of heritor and titular, and to provide the clergy with stipends which would not be illusory, out of the teinds of their respective parishes. Charles I., soon after his accession, issued, without the intervention of parliament, a revocation of all appropriations of church lands and teinds made during the two preceding reigns. The powerful barons who were possessors of church property at first menaced resistance, but eventually showed a desire for compromise, and the parties principally concerned entered into four submissions, in which they accepted his majesty's arbitration. The decrees arbitral pronounced by the king resulted in the establishment of valuations of teinds, and sales of them to the proprietor of the lands, by which the division of the produce between the owner of the land and the owner of the teind was avoided; and the teinds were made available to their utmost extent for the support of the parochial clergy. A commission, appointed to carry out the decrees arbitral, was continued from time to time till the union, when its authority came to be vested in the court of session, as court of the commission of teinds, the same tribunal which still exercises jurisdiction, both judicial and ministerial, in questions relating to teinds. A heritor, and in some circumstances the minister, may pursue an action of valuation of teinds; and a heritor may also insist on purchasing the teinds of his lands when valued, that is, in paying the value of the annuity in a lump sum. The modifying of reasonable stipends to the clergy, out of the teinds of their respective parishes, is one of the functions of the court of commission of teinds. The practice of augmenting stipends after they have once been modified was introduced with some hesitation; confined at first to stipends below the minimum, it afterward became general; and was recognized by act,

48 Geo. III. c. 138, which provides that no stipend can be augmented till 20 years have elapsed from a previous augmentation. By 50 Geo. III. c. 54, it was provided that the minimum annual value of any stipend should be £150; and if such amount cannot be made up by the teinds, it is supplied from the exchequer. See **STIPEND**.

The present position of the tithes of Scotland is as follows: In the majority of cases they have been purchased by the proprietors of the respective lands, after the modification of stipends to the ministers, and are held liable to the burden of augmenting those stipends to the extent of their value; in other words, there are no tithes, but part of the rent of the proprietors constitutes minister's stipend, and an additional part is liable to augmentation of stipend. A part of the tithes are in the hands of titulars, also liable to stipend and augmentation—they are, however, no longer drawn in kind; but paid according to valuation, or compounded for in the few cases where they remain unvalued. The teinds which were held before the reformation by the bishops and other dignified clergy, are in the hands of the crown, liable to augmentation of stipend. The teinds which remained in possession of the parochial clergy, still belong to them, but are commuted; and those belonging to colleges and hospitals have in most cases been valued, and are paid by composition, but have not been sold to the owners of the lands.

TEJADA. See **LERDO DE TEJADA**.

TEJUCIGAL/PA, a t. of Honduras, Central America, on the Rio Grande, here spanned by a handsome bridge. The exhaustion of its gold and silver mines and emancipation caused a large decrease in its population, but it remains the leading place of the state. The principal building is the cathedral, a fine specimen of architecture, containing the only public clock in the state.

TEKELI (more properly, *Tökely*), **EMERIC**, Count, a celebrated Hungarian patriot, was descended from a noble Lutheran family, and was born at the castle of Kasmark, in the county of Zips, in 1656. His father, count Stephen, had been implicated in the conspiracy of Zriny and Ragotsky to free Hungary from the rule of Austria; and after his death, and the execution of Zriny and others, young Tekeli sought an asylum in Poland, where he had large possessions. After vain endeavors to recover from the emperor his patrimonial estates, he repaired to the court of Abaffi, prince of Transylvania, who put him at the head of an army of 20,000 men, with which, in 1678, he invaded Hungary. Being joined by numbers of the malcontents, he rapidly extended his conquests, made predatory inroads even into Austria, Styria, and Moravia, till Leopold I. was forced (1681) to temporize with the insurgents, and thus gained over a portion of them. But Tekeli, distrusting with good reason the emperor's sincerity, refused to disarm, and being joined by the Transylvanian prince and the Turks, he was declared by the sultan Mohammed IV. (1682) king of upper Hungary, and again recovered most of the country. Tekeli joined Kara Mustapha in his celebrated inroad upon Austria; but after the failure of the expedition many of his followers fell off from him, and his patron, the sultan, being prejudiced by his enemies against him, he was twice imprisoned by the Turks; and during his detention Hungary was wholly overrun by the Austrians, and Transylvania separated from the Turkish alliance. Tekeli, however, was favored by a brilliant though ephemeral change of fortune in 1690, when, at the head of a Turkish force, he burst into Transylvania, routed the combined Austrians and natives repeatedly, and woke up the energies of his partisans in Hungary; but the imperialists, under the markgraf of Baden, routed his allies, the Turks, at Salankemen (Aug. 19, 1691), and under prince Eugene of Savoy, so completely demolished them at Zenta (Sept. 11, 1697), that they gladly agreed to the peace of Carlovits (Nov. 14, 1697), by which all aid to the Hungarian malcontents was withdrawn. From this time Tekeli lived in retirement in Turkey, at first being munificently entertained by the Turkish government, but afterward so completely neglected that he was forced to adopt the occupation of a vintner. He died at Constantinople in 1705.—His wife, Helena, the widow of Ragotsky, was celebrated over all Europe for her beauty, but was no less distinguished for her heroic gallantry, as was proved by her obstinate defense of her castle of Mon-gatz (Hung. *Munkacs*) against an army of imperialists. Forced to surrender, to save the lives of her children and the property of her (Ragotsky's) family, she was afterward exchanged for an Austrian general whom Tekeli had captured; and joining her husband at the cost of abandoning her children, shared the vicissitudes of his fortune, and died in 1703.

TELAMONES (see **ATLANTES**), statues employed as columns to support a wall, cornice, etc.

TELEDU, *Mydaus meliceps*, a quadruped of the weasel family (*mustelidæ*), a native of the mountains of Java, at an elevation of 7,000 ft. and upward; remarkable, like the skunk (q.v.) of America, for the excessive fetor of a volatile secretion formed in glands situated a little within the rectum, the emission of which is its principal means of defense.

TELEGRAM, a communication sent by telegraph (q.v.). This word, which was coined some years ago by a writer in the *Times* newspaper, was objected to at the time by Greek scholars as a barbarous formation. According to the law of Greek compounds, *grapha*, compounded with anything but a preposition, becomes *grapheo*; therefore, with *têle*, it

would be *telegraphæo*, the noun from which would be *telegraphæma*. The convenient conciseness of *telegram* has, however, made it triumph over the more correct *telegrapheme*.

TELEGRAPH (Gr. *tele*, far off, and *grapho*, to write) is a general name for any means of conveying intelligence other than by voice or writing. The idea of speed is also implied. Alarm-fires (see BEACON), the semaphore (q.v.), and the signals (q.v.) used at sea, are among the earlier forms of telegraph. But all other agents are now thrown into the shade by the electric telegraph. It has been reserved for our own day to develop into practical use the capabilities of electricity and magnetism as a means of distant communication; although in earlier times, the possibility of such a use of this natural power has been frequently suggested. The public use of the electric telegraph dates not earlier than 1846; but the idea that magnetism could be applied for distant communication is at least two centuries and a half old. Galileo, in one of his dialogues on the rival astronomical systems, written in 1632, puts in the mouth of one of his speakers, a reference to a secret art, by which, through the sympathy of a magnetic needle, it would be possible to converse across a space of two or three thousand miles. In 1753, a letter appeared in the *Scots Magazine*, bearing the initials C. M., and headed "An Expeditious Method of Conveying Intelligence," in which we must recognize the first perception of the uses to which telegraphy might be put. This interesting letter starts with the remark that it "is well known to all who are conversant in electric experiments, that the electric power may be propagated along a small wire from one place to another without being sensibly abated by the length of its progress;" and it goes on to describe an arrangement of wires corresponding in number to "the letters of the alphabet, to be fixed in glass or jewelers' cement at intervals of 26 yards, and to convey, from an electric machine or rubber, a current which would lift each letter, "marked on bits of paper, or other substance that might be light enough" to rise to the electrified ball which formed the terminal of each wire. The apparatus proposed is crude and clumsy, yet we can hardly fail to recognize, in the letter of this Renfrew man, the full appreciation of what the electric telegraph might become. From a period shortly anterior to the date of the letter in the *Scots Magazine*, down to 1837, a large number of proposals, more or less ingenious, are on record. The space at our command will not permit us to describe all those inventions, or to enter upon the much-vexed question as to who is entitled to the name of inventor of the electric telegraph. We must be content to furnish a description of the more important instruments in use, some statistics of the more recent history of telegraphy generally in this country, and a notice of the progress of submarine telegraphy. In our description of instruments, etc., we shall assume the reader to be familiar with the chief facts of galvanism (q.v.) and electro-magnetism (see MAGNETISM).

Telegraph instruments may be classed under two heads, namely, those which record the signals, and those which only give passing signals to the observer or listener. Among the former are several kinds, namely, those giving a record in arbitrary signs (*i.e.*, in the dots and dashes of the Morse alphabet); those which print in ordinary characters, such as the Hughes type-printing instrument; and lastly, a class of instruments giving a *fac-simile* of the message. The latter two classes are not much used, and the number of Hughes instruments in use in this country has somewhat decreased. The great bulk of the telegraphing of the world is done either by the Morse printer, or by the non-recording instruments; and to those we shall therefore devote the major part of our description.

The Morse.—The leading principle in the Morse and other allied instruments is, that by the depression of a key or other method, an electric circuit is "closed" or completed, and a signal is transmitted along the wire to the distant station, where, on its arrival, it reproduces the signal by the action of an electro-magnet or otherwise. Electrically, the Morse consists of the transmitting key, (fig. 2) and the electro-magnet and armature (fig. 1);

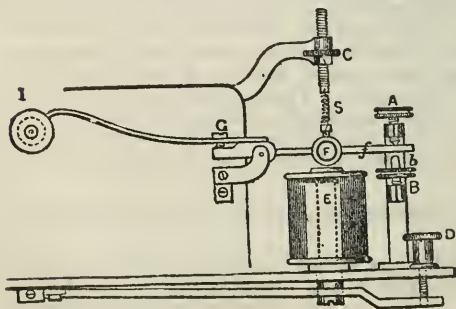


FIG. 1.

while mechanically, it consists of a lever, with circular wheel or disk, attached to the armature, and a clock-work arrangement by which the paper tape to be printed upon is carried forward under the disk. Fig. 1 represents the electro-magnet and armature by which signals are received. On the current being received from the distant station, it traverses the coils of the electro-magnet E, and the armature F is drawn down by the action of the current. A and B are screws for regulating the play of the armature, and of the inking-disk I, at the other end of the lever. The instrument clerk is first required to adjust B so that the upper edge of the disk shall press gently against the paper tape (which is not shown in the engraving) and the screw A, so that the under surface of the disk shall dip into the ink-well or reservoir (likewise omitted in the diagram). B having been adjusted, the screw D is turned so that when the brass stop *f* rests

upon the stud *b*, the poles of the magnet shall clear the armature without actually touching it. A thin streak of light should be seen between the armature and the poles. Screw *C* is used to adjust the spiral spring above, by which, on the cessation of the electric current, the armature is drawn back and the disk ceases to mark the paper. In the first Morse instruments the marks were made on the paper with a pointed style (the instrument being thus known as the *embosser*); but by the invention of the ink-writing arrangement of Siemens, which we are now considering, the legibility and permanence of the record were secured, besides the advantage that a very light current will serve to make the marks. The case containing the clock-work, the arrangement of wheels by which the paper tape is unwound and carried forward, and the switch, by which the running of the tape is stopped, are not shown in the figure. The passage of a current draws down the armature, and elevates the disk, causing a straight mark on the tape so long as the current flows. When it ceases, the spring *S* draws back the armature as already described, and the mark is discontinued. Thus the duration of the current determines the nature of the mark, a momentary passage causing a dot, a longer depression of the key a dash; and as the alphabet invented by prof. Morse consists of dots or dashes, or a combination of the two, the above figure and explanation disclose the whole mystery of this system of telegraphy to those who have mastered the phenomena of electricity.

The Morse Alphabet.—Before going further, the details of this alphabet, universally recognized as a masterpiece of cryptography, may be given. The signals, as given below, are arranged in the groups, and accompanied by the mnemonic phrases, adopted by the British post-office when, in 1870, the transfer of the telegraphs to the government rendered necessary the rapid training of thousands of telegraphists throughout the kingdom:

<p>Group 1.</p> <p>• E, Earwigs •• I, infest ••• S, summer •••• H, houses.</p>	<p>Group 2.</p> <p>— T, Turnips — — M, make — — — O, oxen — — — — Ch, cheerful.</p>
<p>Group 3.</p> <p>• — A, A • — — W, wet • — — — J, jacket's • • — U, uncomfortable, • • • — V, very!</p>	<p>Group 4.</p> <p>• • N, No • • • difficulty • • • • B, baffles • — — G, great • — — — Z, zeal.</p>
<p>Group 5.</p> <p>• • • R, Remember! • • • • L, law • — — — P, preserves • • • — F, freedom.</p>	<p>Group 6.</p> <p>• • — K, Kindness • — — — C, conciliates • — — — — Y, youth • • • — X, extremely • — — — — Q, quickly.</p>

The arrangement for the numerals is equally ingenious. Each figure is represented by five signals, thus:

1, • — — — —	6, — • • • •
2, • • — — —	7, — — • • •
3, • • • — —	8, — • • • •
4, • • • • —	9, — — — — •
5, • • • • •	0, — — — — —

These are the numerals printed long, but on busy circuits expert clerks adopt the practice of "sending short," omitting all after the first dash in 1, 2, and 3, four of the dots in 5, and all before the last dash in 7, 8, 9, and 0. It is stated that prof. Morse founded his alphabet upon information given him by his brother, a journalist, as to the numerical relation of the letters in the English alphabet, the simplest signal (a dot) being given to E, and the next simplest (a dash) to T, those letters occurring most frequently in our language.

The Transmitting Key.—The "key" or hammer by which signals are transmitted from the operator at the sending office, is shown in fig. 2, in one of its earliest and most simple forms. The lever *l*, *l* turns on its axis *A*, and has on its under side two platinum nipples, *m* and *n*. *L* is the line-wire, connected with the axis; *E*, the "earth"-wire (passing through the Morse on its way to earth, and producing its signal there); and *C*, a wire connecting the stud *a* with the battery. As the key stands in the figure, it is in the position to receive a current from the distant station, the course of the current being *L*, *A*, *l*, *n*, *b*, and thence to the electro-magnet of the Morse *en route* to earth. When it is desired to send a current, the handle *H* is depressed, and the

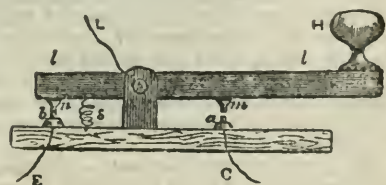


FIG. 2.

current, generated in the battery, then comes by the wire C, and passing through *a*, *m*, and A, proceeds by the line-wire to the distant station. Various modifications of this key are in existence, but in all the principle remains the same, that the electric circuit is closed or completed by the depression of the key. The length of time during which the handle is depressed determines the length of the mark produced at the other end. Thus, if the clerk presses down the handle while he says "one—one two three," the ink-disk at the other end gives the mark . — (dot dash) or the letter A, and so on through the various letters of the alphabet.

The Battery.—For the generation of power in the electric telegraph, Daniell's batteries (see GALVANISM) are chiefly employed in this country. Various forms of the Bunsen battery are also used, especially on the continent. The power employed varies with the length of line, the condition of the wires as regards insulation, and the nature of the instruments used.

The Circuit.—The mode of joining up two stations by means of earth-wires, batteries, instruments, and line-wires, is shown in fig. 3. Assuming S and S 1 to be telegraph stations, P and P 1 are the "earth"-plates (see subsequent paragraph), B and B 1 the batteries, *n* and *n* 1 the electro-magnets and armatures, and *b*, *k*, *g* the transmitting keys and galvanometers. L, L show the line-wire, supported on poles and insulated. The key at station S is shown depressed, so that a current of electricity may be supposed to be passing from the battery B through the key and galvanometer along the

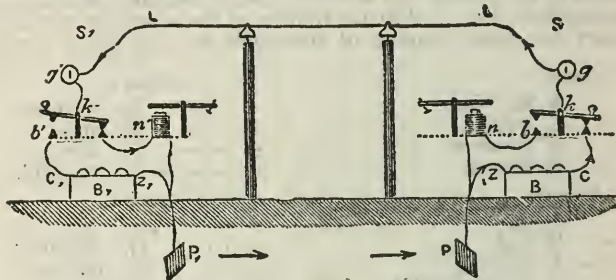


FIG. 3.

line-wire, and thence through *k* 1 and *n* 1 to the earth-plate P 1. Supposing, then, that the clerk at S desires to send a message to S 1, he depresses the key *k* several times so as to send a series of dots and dashes corresponding to the name (or rather the code signal representing the name) of the distant station. The attention of the clerk being gained by the clicking of the Morse, he turns the switch to set his paper tape in motion, gives the signal that he is ready, and the message is then sent.

The Line.—From fig. 3 some idea may be gained as to the mode of carrying a wire or series of wires over posts, these posts being carried along the sides of a road or railway. In towns, wires are carried "over-house," or by underground pipes, the wires in the latter case being insulated by means of a gutta-percha or other suitable covering. The subterranean method is being applied to extended lines, especially in Germany, and is found to answer as well as the over-head system, while it avoids many of the casualties to which the latter is liable. In pole and over-house lines, the wires are kept from each other and from contact with the earth by insulators of various kinds. White porcelain and brown stoneware are the chief materials used. The former, when of good quality, well glazed and well burned, is perhaps the most perfect of all insulating materials, and does not deteriorate with age. The fewer the poles are in number on which the wires are suspended, the better is the insulation and the less the cost, but the liability to accident is probably greater. The number of poles used varies from 16 to 30 per mile, and is governed by the number of wires carried, the configuration of the track, and other considerations. On road lines, the number of poles is generally larger than in the case of telegraphs carried alongside railways, the greater levelness and straightness of the latter reducing the number of supports required. The wire chiefly used for inland telegraph purposes is of iron, galvanized, and of No. 8 ($\frac{1}{8}$ in.) gauge. The conductivity of a wire increases in the ratio of the square of its diameter (the resistance decreasing in the inverse ratio), and the advantage of using a thicker wire on the longer lines is thus seen. No. 4 wire is, for this reason, used on some of the longer lines.

The Earth—Earth Currents.—Mention has been made of the "earth," in the preceding description. This is the technical expression used in relation to the fact discovered by Steinheil in 1838, that the earth itself serves the purpose of completing the circuit,

and renders the employment of a second or return wire unnecessary. The "earth" may consist of a buried plate of metal connected with the battery or line-wire, and of sufficient surface to afford the necessary diffusion. The gas or water pipes of a town form excellent "earths," care being taken that the connection is made with the pipe itself, and not with a branch, where a badly made joint might spoil the connection. Where dissimilar "earths" are in use, as for instance, a copper plate at one end, and an iron pipe at the other, a *quasi* battery is created, and vexatious currents pass along the line. Hence the "earths" on a circuit should be made alike. The earth, being regarded as a large reservoir of electricity, offers no sensible resistance to the passage of the current, in the same way as the ocean would receive or supply at any point an indefinite quantity of water. While this quality of the earth is one of the most valuable aids to telegraphy (reducing so materially the cost of wire erection), it presents at times those embarrassing interruptions known as *earth currents*. These currents, at all times unwelcome visitors to a telegraph office, are very variable, changing rapidly at times from positive to negative, altering their direction with the hour of the day, and leaving one circuit to appear on another in a manner not explainable. The lines most liable to such disturbances are those running n.e. and s.w.; that is, connecting places separated in a straight line in those directions, and without reference to the actual direction of the wires. The easiest remedy for earth currents, when they are of sufficient strength to affect the lines, is to dispense with the earth connection, and revert to the original plan of using two wires. Thus between places where there are two wires, both may be disconnected from "earth," and used as a complete metallic circuit. Another remedy has been found in extending the circuit by joining to it a further wire, the terminal point of which lies beyond the direction or line in which the earth current is flowing. We must refer to the larger treatises on telegraphy for information regarding lateral induction, velocity of electric discharge, the tests for resistance, insulation, etc., and also for notices of some of the less prominent pieces of apparatus now found in the instrument-room of the electrician.

The Relay.—We now proceed to notice several methods by which the transmission of signals is facilitated or accelerated. First among those may be placed the *relay*. Siemen's polarized relay is now in very extensive use in this country. In the previous description of the Morse, we have assumed the instrument to be worked directly by the current sent along the line. On long circuits, however, direct working could only be

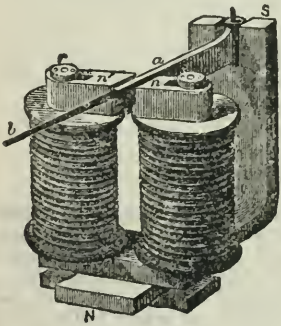


FIG. 4.

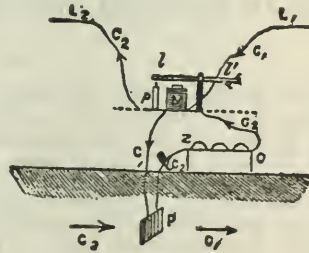


FIG. 5.

accomplished by great battery power, as, owing to inevitable loss by leakage, a current loses greatly before it reaches its destination. It is found to be a much better arrangement to have the instrument worked by a "local current," derived from a local battery at the receiving station. The mode by which this is accomplished will be seen from the diagrams. In the figures, NS is a hard steel permanent magnet, whose s. end S has a slit, in which the soft iron armature, *a*, is pivoted. To this armature a thin aluminium tongue, *b*, is attached, which, by making contact at the point *c* (fig. 4), completes the local circuit. To the n. end, N, of the permanent magnet the soft iron cores of the electro-magnet are fixed, as shown in the sketch. When the armature is equidistant from the poles of the electro-magnet, it is equally attracted by both; but if it be brought nearer to one than to the other, it will be held there, because it is under the influence of a more powerfully attracting force. Since the relative distance between the armature and the two pole-pieces may be increased at will, the attraction between either pole and the armature may be regulated with any degree of nicety. The electrical contacts for

the local circuit are seen in fig. 4, which is shown with the local circuit completed. When two stations far apart are to be connected by telegraph, it is usual to transmit the signal to a half-way station, and thence to re-transmit it to its destination. The retransmission is not effected by manipulative skill, but by mechanical contrivance, so that, while the half-way station may read the message sent, no time is lost in the transmission. This is effected by making the intermediate instrument act as a relay in transmitting a message to the next station. The system, to be fully explained, would require more detail than we can here give to it. We shall only show how it is effected, leaving out of account how all the stations can communicate as in one circuit. The current C_1 , (fig. 5), from the sending-station enters the coil M , and goes thence to earth P , and returns as shown by arrow C_1 . The instrument may record or not as required, but its doing so in no way interferes with translation. The copper pole C , of the battery CC , is connected with the lever ll' of the register, and the zinc pole is to earth. When the lever is drawn down by the current C_1 , it strikes against the point at the top of the pillar p , that checks its motion. The pillar p is joined to line L_2 , running to the further station, and when the lever falls, a second circuit—viz., that of the battery CZ —is closed, in which C , the lever, the pillar L_2 , the further station, the earth, P , and Z are all included. Thus, as ll' prints at the intermediate station, it at the same time sends a new printing-current to the next. When it ceases to print, so does the instrument at the distant station.

Wheatstone's Automatic Transmitter.—The speed of the ordinary Morse instrument is limited to the rapidity with which the hand of the operator can move the key, so as to preserve the proper spacing between the marks at the receiving instrument. We are indebted to sir Charles Wheatstone for an apparatus which trebles, and in some cases quadruples the carrying capacity of a wire, securing, at the same time, mechanical accuracy in the relative size of the dots, dashes, spaces, etc. To effect this, three different instruments are required: First, there is a perforator, by which holes are punched in a paper slip to correspond with the signals required. The operator strikes three disks, the central one producing a central hole, which is of no avail electrically, only carrying forward the paper; the left-hand disk producing two holes, directly opposite to each other, on the sides of this central row; and that on the right producing two holes, placed diagonally to each other. The passage of the electric current is regulated by the position of the outer holes. Those opposite each other admit of a momentary passage of the current through the "transmitter"—used in sending the message—while the holes diagonally placed produce a lengthened mark, corresponding to the dash. The following diagram represents the word "and," as shown on the punched slip:

```

      o o      o o      o o
o o o o o o o o o o o o o o
      c o      oo      o o

```

As printed at the other end, this reads:

```

      —      —      —
      a      n      d.

```

The third portion of this instrument is the "receiver," in which the currents sent by the action of the punched slips in the transmitter are reproduced in the dots and dashes of the Morse code—the printing being, moreover, done with a mathematical accuracy which keying by hand cannot attain. The speed of transmission depends on the length of line and state of the atmosphere; but the movement of the clock-work, both of transmitter and receiver, is capable of adjustment to any speed below 120 words per minute. When the post-office took possession of the telegraphs in this country, the Wheatstone automatic instrument was in use at only four stations in the kingdom. It has since come into extended use; and one of its most successful applications is in the simultaneous transmission of news from London to a large number of towns. The punched ribbon is carried from one transmitter to the other, the circuit to Birmingham, Manchester, and Liverpool (on which the highest speed is attained) sending it first, and from that instrument it passes to several others, each serving several towns. The adjustment of "resistance," by which a message is run off simultaneously at Edinburgh, Glasgow, Dundee, and Aberdeen by one sending from London (and so through the various transmitters where this system of "express news circuits" is adopted), forms one of the most interesting objects of study in the practical working of the telegraph in this kingdom. By combining the automatic transmission with Bain's principle of producing marks on chemically prepared paper, an American inventor has accomplished still higher speed, the lever action of the inking disk (fig. 1) being saved.

Other Instruments.—All that has been said as to the battery, the earth insulation, etc., is applicable to nearly every instrument now in use; the exception being several magneto electric instruments, such as Wheatstone's "ABC," in which the use of a battery is dispensed with, power being generated by two bobbins coiled upon an armature rotating continuously over the two poles of a permanent magnet. On the upper surface

of this instrument is seen a circle of buttons corresponding to the letters of the alphabet, by means of which levers, arranged vertically in a circle, may be pressed down. These levers press a pitch chain into a series of indentations on the periphery of a metal disk, the chain having sufficient slack, so that, when a second lever is depressed, the first must be raised. A series of currents, corresponding to the number of letters between each lever pressed down, is sent into the line, and operating on two little bent magnets, moves forward a ratchet wheel, having a pointer on the same axis which shows the letter on a dial card. In this way the message is spelled out letter by letter, and as the instrument gives not an arbitrary sign, but the letter itself, it is much used in private telegraphs and for the smaller post-offices throughout the kingdom. The non-recording instrument most used in this country (excluding private telegraphs) is the single-needle instrument of Cooke and Wheatstone. It consists of an upright galvanometer, with astatic needles, one of which moves within the coil, and the other upon the front of the dial. The needles are loaded at the lower end, to maintain them perpendicular when no current is passing. The instrument is worked by means of two keys, like those of a piano, a deflection of the needle to right or left being effected by depressing one or other of the keys. The signal is shown both on the sending and receiving instrument. The Morse alphabet is used, a deflection to the left corresponding to the dot, and one to the right representing the dash.

Acoustic Telegraphy.—Before the introduction of high-speed automatic instruments for the more important circuits, expert telegraphists in many cases dispensed with the reading of the printed slip, reading by the sound, which, by long practice, became a language perfectly intelligible to them. The great advantage of this was, that the use of the eye was obtained exclusively for the task of writing down the message. In sir Charles Bright's "bell" instrument, most admirable results, in point of speed, have been attained. The bells, different in sound, are placed at the two sides of an upright instrument, so that the clerk, bending forward to write, may concentrate his attention on that duty, translating in his mind the tinkle of the hammers as they ring out their message. The bells are now worked in the Morse code—the left bell a dot, and the right bell a dash; but when first introduced, the instrument had a code of its own, based on the desire to complete each letter as much as possible on one bell. A simpler acoustic telegraph has been brought into use in America (hence called the "American sounder") and in this country. This instrument is, shortly stated, the Morse without its wheel-work and ink-printing apparatus; and its whole construction is shown in fig. 1, omitting the inking disk. The use of the "sounder" has greatly increased in this country owing to its cheapness and efficiency. For a description of the type-printing and *fac simile* instruments, on which great advances have been made of late years, we must refer our readers to the larger treatises on the telegraph and its history.

Duplex Working.—The fact that two currents may be sent simultaneously (one from each end) has been long recognized by electricians, but the principle of the duplex was revived and patented by Stearns, an American, in 1872. At first the duplex-working was only tried on short circuits of 40 to 60 m.; but it has now become a matter of daily use on every busy circuit, long or short, both in this country and abroad. The principle of the duplex system is that the current sent on the depression of the key is divided into two parts, one-half being carried through one pair of coils in a differential galvanometer to the line, and the other half through the other pair of coils to a resistance coil, and thus to earth. The resistance of the latter is made exactly equal to that of the line-wire, and the instrument of the sender being so placed that this divided current presses equally in each direction, this instrument remains unaffected, while the armature at the other end responds to the signal sent. At the same time a telegraphist at the other end is sending a current, which is divided in like manner, and leaves his own instrument unaffected while operating on the armature of the first instrument. The two currents on the line-wire assist or oppose each other in such a way as to affect the equilibrium in the differential galvanometer, but each operates only on the distant instrument. Duplex-working led to *duplex*, that is, two messages passing over a wire in the same direction at once, and to this has followed quadruplex and multiplex telegraphy. Quadruplex working was first perfected in 1876 by Prescott, Edison, and Gerritt Smith, but the possibility of its being accomplished was suggested by Stark of Vienna, in 1855. It was introduced into Britain as a practical branch in 1878, and is now used from London to Liverpool, Dublin, and other towns. An illustration of the value of these additions to the wire power is afforded by a wire from Chicago to Pittsburg, 550 m., which is quadruplexed, and at Pittsburg branches off in two duplex circuits to Baltimore and Philadelphia, giving Chicago duplex communication with these two places. In the same way Middlesborough and West Hartlepool have been duplexed to London, on separate wires as far as Leeds, and quadruplex on one wire thence to London.

Multiplex Telegraphy and "Phantom" Circuits.—The most original feature of the telegraph section of the Paris exhibition of 1878 was the harmonic telegraph of Haskins and Gray, based on principles laid down by Cromwell Varley in 1870. In one application it occupies a place midway between duplex and multiplex telegraphy, namely in the "way duplex," or as it was felicitously termed by the late Mr. Orton, the "phantom circuit." A wire may be occupied by the ordinary business of a series of intermediate

offices, while there may be superimposed on that a through traffic (which can be duplexed) between the terminal stations. Thus between Chicago and Dubuque, a wire provides for 17 intermediate stations, working ordinary Morse sounders, while the harmonic telegraph (the principle of whose action is vibratory currents sent and received by musical forks tuned in unison) works between the terminals. By an extension of this principle we have the multiplex telegraph, each fork taking off at the receiving end those vibrations corresponding to its own tone.

The Electric Pen.—Amid many endeavors to introduce an autographic telegraph that of Cowper, made public in 1879, is the most successful. It has the drawback of requiring two wires, but is so beautiful in its action as to deserve notice here. Two series of resistances are ranged like the letter **L**, one series affected by lateral, the other by the up-and-down motion of the sender's pen. At the other end a siphon recorder moves in accordance with the currents thus sent, giving on a moving slip of paper an exact *fac-simile* of the writing or other marks of the person sending the message.

Statistics.—In Great Britain the first public introduction of telegraphy was made in 1846 by the Electric and International Telegraph co. Subsequently the British and Irish Magnetic co. was established, and afterward the United Kingdom co., the last named being started on the footing of a low uniform rate, but eventually yielding to the opposition of the other companies, and adopting a sliding scale of rates. The charges were from 1s. to 6s., according to distance, for a message of 20 words. Besides these companies, there were the London District co., the Universal Private Telegraph co. (which established a series of public telegraphs, connecting Glasgow with places on the w. coast of Scotland), and a large number of railway companies, carrying messages between their own stations, besides acting as agents to collect business for the other companies. In 1868 and 1869, after some agitation of the question, acts were passed transferring the property of the telegraph companies to the post-office, and giving that department a monopoly in the conduct of telegraph business within the kingdom. The task set before the post-office was to reduce and simplify the charges, to separate entirely the public wires from wires used for railway purposes, to extend the telegraph to outlying places and to business parts of towns, and to establish free trade in press telegraphy—the meaning of the latter being that, instead of collecting and supplying news as the companies had done, the department should only arrange to transmit news, at specified rates, for all comers, leaving the newspapers to make their own arrangements for obtaining information. The great progress of telegraphy in the hands of the postal telegraphs department is one of social features of the time. Including a large number of new offices prepared for opening on the occasion, the post-office started in 1870 with 1007 telegraph stations, to which about 1900 railway stations receiving messages on behalf of the department fall to be added. In 1878 the number of offices belonging to the post-office was 3,756, making, when the railway stations are added, a total of 5,311 offices. It appears, however, that the railway offices only take in from the public 7 per cent of the messages sent. The mileage of wire under charge of the postal telegraphs department, and exclusively devoted to public business, in 1878, was 107,353, with 5,980 m. of private wires, for which rents are paid to the department. The number of messages before 1870 was estimated as reaching 6,000,000 annually, and the following gives the totals for three years since the telegraphs passed into the hands of the post-office:

	No. of messages.	No. of offices open.	Weekly average for each office.
Year ended Mar., 1871.	9,850,177	3,926	46
“ “ 1873.	15,535,780	5,540	53
“ “ 1878.	22,171,783	5,311	80

These statistics show that the growth of business had been so large as to raise the weekly average over the whole number of offices, the closing of many small railway stations also helping this result. So far as the cost to the public is concerned, it is shown that, while under the *régime* of the companies the cost per message averaged 2s. 1½d., the cost under the post-office reaches an average of under 1s. 1d. per message. Writing in May, 1872, Mr. Scudamore, under whose direction the transfer and extension of the telegraph system was conducted, says: “If the messages of the current financial year were to be paid for at the old tariff, they would cost the senders at least £400,000 more than they will cost.” The revenue for 1877–78 was £1,333,542, including in this private-wire rentals, newspaper special wires, etc. The capital invested in the undertaking amounts to about ten millions sterling. The cost of working in 1877–78 was £1,164,131: the staff consisting of 406 persons in the central control of the system (secretary's and accounting offices); 650 in the engineering department (for maintenance and extension of the system); a staff of 1770 in the central office at London; and the services of postmasters, telegraphists, etc., throughout the kingdom, making a total of above 11,400 persons engaged in the service. Of these, 4,981 were messengers engaged in the delivery of messages, the larger portion of whom were supplied with uniform. In addition to electric means of

communication, the post-office uses pneumatic tubes in London and other cities to connect the larger branch offices with the principal station in each case. As those tubes, although forming an interesting branch of the apparatus, are not, strictly speaking, electrical, we must refer to other sources for information as to their construction, mode of working, power used, etc. The result of the transfer from private hands to the control of the government may be summed up in saying that for efficiency, comprehensiveness, and public appreciation, the telegraph system in Great Britain is now second to none in the world. The continent of Europe forms one vast net-work of telegraph lines. By means of submarine cables (as afterward noticed), the offices in this country are connected with all the four continents, while recent extensions have brought the Australian colonies also into connection with the other sections of the globe. While each kingdom fixes its own internal tariffs and regulations, the rules for the interchange and transmission of telegraph messages between the various countries of the world are regulated by telegraph conventions agreed to at Paris, Vienna, Rome, St. Petersburg, and London (the last named being held in 1879); and all official intimations in connection with international telegraphy are issued from a central bureau in Berne, Switzerland. To the mountain republic the world is indebted, not only for the example of an excellent and cheap internal system, but for the suggestion of this central administration, where all international matters are conducted. In France and Belgium internal telegraph arrangements are complete and cheap; while the United States for many years held a place far in advance of other countries in the ordinary every-day use of its great telegraph organizations. Perhaps the most striking instance of telegraph enterprise is that by which the daily newspapers of San Francisco are enabled to give, by means of a line of telegraph carried over the Rocky mountains (on the line of the Central Pacific and Union Pacific railroads), not only the news from New York, but the parliamentary news from London, the prices of all the continental exchanges, and quotations from Calcutta and China of the previous day.

Submarine Telegraphy.—From the year 1850, when a copper wire insulated with gutta-percha, submerged between Dover and Calais, continued in use for one day, the progress of submarine telegraphy has been as remarkable as that of telegraphy on *terra firma*. The Malta-Alexandria cable was laid in 1861, and continued in use till 1872, when, from repeated breakages in shallow water, its use was discarded. The core consists of a strand of seven copper wires, covered by three layers of gutta-percha; outside of this, a serving of tarred yarn; and, finally, eighteen iron wires, constituting the sheathing. This was the first long cable successfully laid (its total length, in three sections, being 1331 miles); and it was also the first properly tested under water before being laid, and carefully constructed with constant watchfulness as to its electrical and mechanical conditions. This cable was thrown out of use because the chafing it underwent in shallow water made it too expensive in maintenance. So far as construction goes, it corresponds very nearly with sir James Anderson's typical "successful iron-covered cable." With careful testing and supervision, and with the weight of cable, etc., duly proportioned to the strain, etc., a cable forms a permanent property of much value. A new form of cable, with lead as the conductor, has been suggested. In 1877 the task of duplexing a submarine cable was accomplished by Muirhead on the Aden and Bombay cable of the Eastern Telegraph company, and the "artificial line," or balance, has been since applied successfully to other cables, including two crossing the Atlantic. In view of the enormous cost of submarine telegraphy, the attainment of a means by which the carrying capacity of a cable is nearly doubled is of vast importance. In 1877 the Marseilles-Algiers cable, belonging to the French system, was duplexed by M. Ailhaud. The *Journal Télégraphique* gave in 1877 a list of 149 cables belonging to companies, and 420 belonging to government systems, existing at that date. In point of number, Norway stood first, with 193 cables, but the total length of these is only 233 nautical miles. The total length of the 420 government cables was 4,442 nautical miles, of which Britain possessed 49, measuring 1338 miles. The longest of these (excluding cables to the continent) is to Guernsey 70, and to Shetland 63 miles. The company cables (of which 96 per cent had their administration in London) measured 59,547 nautical miles. The longest cable is that from France to America, 2,585 nautical miles, and the largest organization that of the Eastern and Eastern Extension companies, embracing 48 cables of a total length of 21,883 nautical miles, to which, since 1876, several thousand miles have been added in new routes or duplicated cables. In 1879 Great Britain was connected with Europe by eighteen cables, and with Ireland by five cables. From Europe to America seven cables crossed the Atlantic (five from Ireland, one from France, and one from Portugal to Brazil). A cable from Nagasaki to Shanghai joins the internal system of Japan with the outer world; while by cables of 557 miles from Singapore to Batavia, and 1082 miles from Java to Australia, the distant colonies are brought into the telegraph system of the world. Many additional cables, including one to Natal and the Cape, are projected or in course of construction; and before long it cannot be doubted that the imagination of the poet, to "put a girdle round the earth in forty minutes," will be cast into the shade by the realities of the electric telegraph.

See works on *Practical Telegraphy* by Culley, Sabine, Preece and Siveright, etc.;

Journal of the Society of Telegraph Engineers; sir James Anderson's Lecture before the statistical society, London, June 1872; Mr. Scudamore's reports to the postmaster-general, 1870 and 1872; estimates for the telegraph service, laid annually before parliament, etc.

TELEGRAPH (*ante*). The practical application of the scientific laws under which the telegraph operates—in the form of the instrument still, with certain modifications, in general use—is supposed to have been first made by S. F. B. Morse (q.v.) in 1832-35. In 1828 a similar idea was demonstrated by Harrison Gray Dyar, of New York, in an instrument which transmitted frictional electricity through a wire, the charges being recorded by being passed through a moving sheet of litmus paper. It is alleged that the same principle had been demonstrated nearly a century before in Scotland; in 1774 in Geneva, Switzerland; and in 1816 in England, by Ronalds. The first *telegraph line* in operation was between Paddington and Drayton, in England, in 1835, and was 13 m. in length. This antedated the Morse line, which was laid between Washington and Baltimore, by seven years. The printing telegraph was first invented by Alfred Vail, of New Jersey, in 1837, but it was not until 1841 that Wheatstone made his first model of the instrument. In 1845 Mr. C. J. Fleischmann exhibited the Morse apparatus to the emperor of Austria, at Vienna, and with such success that it was adopted by the Austrian government. In 1848 two Americans built a line between Hamburg and Cuxhaven at the mouth of the Elbe, a distance of 90 miles, which was operated on the American plan with Morse instruments, and was employed for reporting marine news. The Wheatstone apparatus did not work well except through comparatively short distances, and at a very low rate of speed, and was altogether inferior to the Morse telegraph. The superior efficiency of the latter in working direct through long distances was caused by the application of the relay and local circuit. In Oct., 1851, a convention met at Vienna of deputies from Austria, Prussia, Bavaria, Württemberg, and Saxony to effect a common and uniform telegraph system. By this convention it was decided that the Morse system was practically the best, and this was therefore adopted. In the beginning of Morse's experiments he made use of the fountain-pen and other devices for recording the characters; but in the end the stylus or steel point for embossing these was found to be the most convenient and satisfactory.—The telegraph business in the United States has long tended toward concentration and consolidation. Gradually the various companies that have from time to time been formed have been bought up, until the Western Union telegraph company represents nearly the entire scope of this interest in the country. This result has been achieved mainly by the purchase of valuable patents, among which those of Edison have been perhaps the most important. As to these, including the quadruplex system, see EDISON, THOMAS A. The number of telegraph offices in the United States on July 1, 1879, was 8,534, the total length of lines, 82,987 m.; and the length of wires, 211,566 m.; the number of messages transmitted in the United States during the year ending June 30, 1879, was 25,070,106.

Within the past few years there has been an important and comprehensive movement in the direction of ocean telegraphy, which had previously for a considerable period been comparatively neglected. English companies have laid three long ocean cables in the east; and a French organization of capitalists have laid a transatlantic double line. The duplication of the lines of the Eastern telegraph company from England to Bombay was completed in 1878. A similar duplication on the part of the Eastern extension telegraph company has extended the connection from Bombay to Australia by way of Madras, to Penang in the Malay peninsula, and to the East Indian islands. In 1879 the Eastern telegraph company were engaged in laying their cable to the cape of Good Hope. An agreement was made by this company with the British government to have their line down between Durban and Zanzibar by the end of July, 1879, and to have the whole cable laid and in working order by the end of the year. In consideration of an annual subsidy of \$17,500, this company agreed to give priority to government messages, and to transmit them over the cable, which was to have a capacity of fourteen words per minute, at half the rate charged the public. The British government also stipulated for the right to take possession of the wires and offices, or to permit any of the colonies so to do, in the event of the occurrence of a war, rebellion, or any other public necessity, and to retain possession so long as this might be required, on the payment of a reasonable sum in compensation. The Cape cable is covered with a brass wrapping, to protect it against the ravages of the teredos and other injurious insects, except as to those portions laid in the deep-sea, where there is no danger from these annoyances. On Nov. 16 the American end of the new French cable, which was manufactured in the workshops of the Siemens Brothers in Charlton, England, was landed at North Eastham, Mass., on Cape Cod, from the steamer *Faraday*. This cable was constructed and submerged at a more rapid rate than any other ever known, the line being completed and messages sent from continent to continent seven months after the concession had been granted to the company by the French government. At about the same time a new cable was put down between Germany and Norway, this being done at the cost of the German government. Prior to that, the only telegraphic communication between Germany and Scandinavia was by way of Denmark. The new cable is a three-wired

TELEGRAPHS OF THE WORLD IN 1877.

	No. of offices.	Length of lines, miles.		No. of offices.	Length of lines, miles.
Argentine Republic.....	182	5,320	India, British.....	225	15,705
Australia and Polynesia.....	658	22,039	Italy.....	1,408	45,557
Austria-Hungary.....	2,924	28,148	Japan.....	1	1,840
Belgium.....	613	3,160	Mexico.....	194	5,760
Bolivia.....	15	475	Netherlands.....	225	2,106
Brazil.....	89	3,510	Norway.....	197	4,827
Canada, Dominion of.....	830	10,995	Persia.....	46	2,458
Chili.....	55	2,650	Peru.....	25	608
Colombia.....	36	1,227	Portugal.....	144	2,190
Costa Rica.....	16	220	Roumania.....	165	2,487
Denmark.....	178	1,591	Russia.....	1,631	57,338
Ecuador.....	10	210	Spain.....	264	7,510
Egypt.....	78	3,980	Sweden.....	628	6,004
France.....	4,406	33,895	Switzerland.....	1,053	4,015
Germany.....	5,109	24,103	Turkey.....	401	17,618
Great Britain and Ireland....	5,375	25,206	United States of America....	8,829	94,714
Greece.....	69	992	Uruguay.....	.....	1,300
Guatemala.....	42	1,226			

TELEGRAPHS OF THE UNITED STATES.

Year.	Miles of Line.	Miles of Wire.	No. of Offices.	No. of Messages Sent.	Receipts.	Expenses.	Profits.	Average Tolls per Message.	Average Cost per Message.	Average Profit per Message.
					\$	\$	\$	c.	c.	c.
1866....	37,380	75,686	2,250	5,879,282	6,568,925	3,944,006	2,624,920			
1867....	46,270	85,291	2,565	6,404,595	7,004,560	4,362,849	2,641,711	104.7	63.4	41.3
1868....	50,183	97,594	3,219	7,934,933	7,316,918	4,568,117	2,748,801	89.3	51.7	34.6
1869....	52,069	104,584	3,697	9,157,646	7,138,738	4,910,772	2,227,966	75.5	51.2	24.3
1870....	54,109	112,191	3,972	10,646,077	7,637,449	5,104,787	2,532,662	69.5	45.7	23.8
1871....	56,032	121,151	4,606	12,444,499	8,457,096	5,666,863	2,790,233	66.2	43.8	22.4
1872....	62,033	137,190	5,237	14,456,832	9,333,018	6,575,056	2,757,962	62.5	43.4	19.1
1873....	65,757	154,472	5,740	16,329,256	9,262,657	6,755,794	2,506,920	54.9	39.5	15.4
1874....	71,585	175,735	6,188	17,153,710	9,564,575	6,535,415	3,229,158	54.0	35.2	18.8
1875....	72,833	179,496	6,565	18,729,567	10,034,986	6,625,474	3,399,510	50.9	33.5	17.4
1876....	73,532	183,832	7,072	21,158,941	9,812,353	6,672,225	3,140,128	43.6	29.8	13.8
1877....	76,955	194,323	7,500	23,918,894	9,861,355	6,300,813	3,551,543	38.9	25.0	13.9
1878....	81,002	206,202	8,014	25,070,106	10,960,640	6,160,200	4,800,440			
1879....	82,987	211,566	8,534							

line, extending from Romøe, an island off the coast of Sleswick, to a point near Arendal. The effect of this enterprise is to throw all telegraphic traffic between Germany and Norway, and the greater part of that with other countries, except Denmark, England, and France, over the new wires, withdrawing it from the Danish lines; this cable was made by Siemens & Halskæe of Berlin. A short cable was laid by Russia across the Caspian sea from cape Gurgian to Krasnovodsk, a distance of 150 miles. This made telegraphic connection between Tjikislar and Asterabad, and messages can be sent, by way of Teheran, by the Indo-European line to Tiflis. The final link in the chain of telegraphic communication around the earth is the projected cable between California and the Sandwich Islands, for which Cyrus W. Field received from the government of the latter country an exclusive concession, and is probably to be similarly favored by Japan and China. The latter two countries have long been ambitious of extending their telegraphic communication with the rest of the world. A recent scheme is for a new cable between America and Europe, to run from New York to Flores, an island of the Azores; two extensions from the latter terminus extending to the European continent, one being to France, England, and Holland; the other to Fayal, San Miguel, and Lisbon. This gigantic scheme comprehends 7,200 m. of cable.—The employment of subterranean telegraph wires, which has gained much favor on the continent of Europe, has been specially extended in Germany. These were at first only used for short distances, but were found to work so well that they have been laid for considerable lengths, and have entirely answered their purpose. There are in England 10,000 m. of underground wire, but there they do not seem to have encountered the same success in their operation. Objections made to their use are that they cost three or four times as much as open-air wires; that their power to transmit currents is only one-third or one-fourth as great; that the rats and mice attack their gutta-percha envelope; and that they are injured by insects, and also by a species of fungus.

In England, however, this plan is adopted with wires passing through large cities. As a new method of insulation discovered by David Brooks, of Philadelphia, obviates the difficulties which interfere with the successful working of subterranean wires, it may be that they will be hereafter employed in the United States. In the new process of insulation the material employed is paraffine oil. The wires are first wrapped in cotton, and then as many as fifty or more of them are bound together in a tight cover of netting, the whole being then inclosed in a pipe. The pipe, when laid under-ground, is kept continually filled with the oil under pressure, being supplied from connecting reservoirs. Since 1877 there have been short lines in successful operation on this plan; one of them being laid in 35 ft. of water under the Schuylkill river. A similar line is to be laid between Philadelphia and New York, when the process will have a more decisive test.—The difficulties involved in establishing telegraph lines between distant parts of the world are, perhaps, best shown in the case of the line between England and Australia. The line now runs from London to Gibraltar, thence to Malta; and from Malta to Alexandria by three lengths under the sea. Thence it crosses the isthmus of Suez to the latter point; and by another length of cable from Aden to Bombay. Here the Australian message takes to the land again, and crosses India by the government lines to Madras, where it is once more transferred to a submarine cable and carried to Singapore, touching at Penang. The messages for China now diverge, and are taken northward to Hong-Kong, Amoy, or Shanghai; while those for Australia are transmitted by cable to Batavia and Java, where they are taken along the Dutch lines to Banjoewang, and thence by cable to Port Darwin, Australia. Land lines connect with Brisbane, Sydney, Melbourne, Adelaide, Hobart Town, and other Australian cities.—The postal telegraph system, as in existence in Great Britain, has attracted considerable attention in the United States, and it may be considered to be under advisement among those interested to effect an arrangement by which the entire telegraph system of that country shall be placed in the hands of the government.

TELEMACHUS, son of Odysseus (see **ULYSSES**) and Penelope (q. v.), was an infant when his father left home to join in the war against Troy, but during the latter's long absence of about 20 years, grew into manhood. At the instigation and under the guidance of Athene (Minerva), who had assumed the appearance of Menēs (commonly known as Mentor, Lat. "the thoughtful one"), king of the Taphians, his father's dearest friend, Telemachus set out in search of his long-lost sire, after having vainly endeavored to eject his mother's troublesome suitors from the house. Having visited Pylos and Sparta, at both of which places he was most hospitably entertained, Telemachus returned home to Ithaca, where he found his father in the guise of a beggar, living with the swineherd Eumæus. After mutual recognition, father and son proceeded to slay the suitors.—In modern times, Telemachus is known chiefly as the hero of Fénelon's (q. v.) romance, *Télémaque*, once very popular as a school-book.

TELEOLOGY, the doctrine of ends, is derived from the Greek *telos*, an end, a word brought into philosophic discussion by Aristotle. The idea of an end entered into the Aristotelian conception of physical science, but more properly into ethical science or morality. All the ancient systems of morality, from Socrates downward, correctly regarded it as a *practical* science; they started with the inquiry, "What is the proper and final end of all human conduct?" and the answer given by each school was the characteristic doctrine of the school. Aristotle answered, "Happiness in a peculiar sense;" the Stoics said, "A regard to the whole universe of being;" the Epicureans, "Pleasure and the absence of pain." John Stuart Mill, in the concluding chapter of his *Logic*, entitled, "The Logic of Practice, or Art; including Morality and Polity," adopts the ancient point of view, and observes that there should be a science of ends, or a reasoned statement of the final purpose of all human action; for this science he suggests the name *teleology*, remarking that it corresponds to what the Germans call the practical reason. There would be comprehended under it, the art of living or happiness, taste or the beautiful, morality, and politics. See **CIVILIZATION**. The word *teleology* is applied to the argument from design in proof of the Deity. This is in keeping with Aristotle's employment of the word in physics. When a natural philosopher assigns the purpose or end of any natural arrangement, as the offensive or defensive weapons of an animal, he is said to give a *teleological* explanation.

TELEOSAURUS, a genus of fossil crocodilès, the remains of which occur in the oolitic rocks. They are found associated with marine fossils, and the peculiar modification of their skeleton seems to have specially fitted them for an aquatic life. Both surfaces of the vertebrae were slightly concave, the hind-legs were large and strong, and the anterior portion of the body gradually tapered into the long and slender jaws, giving the animal the aspect of the gavia of the Ganges, only the jaws were more attenuated, and the nasal aperture, instead of being oblique, opened vertically on the truncated end of the upper mandible. The jaws were armed with numerous equal and slender teeth, slightly recurved, and admirably adapted for the capture of fishes, with which the oolitic seas abounded. No less than twenty species have been described, and these present so many striking differences that they have been arranged under six subgenera.

TELEOSTEI, the order of bony fishes, corresponding very nearly with Cuvier's division of *osseous fishes*, and comprising nearly all the common fishes. The skeleton, instead of remaining throughout life nearly or quite cartilaginous, is nearly or completely ossified. The notochord is not persistent, as in the inferior orders; there is a well developed vertebral column, although it is sometimes more or less cartilaginous. The bodies of the vertebrae are *amphicoelous* or concave at both ends, forming a double conical, or globular cavity which is filled with the cartilaginous or semi-gelatinous remains of the notochord, which confers great flexibility on the vertebral column. The ossification is not carried further, except in the bony pike, a ganoid. The skull is much complicated, being composed of a great number of distinct cranial bones, and a lower jaw, or mandible, is always present. The pectoral arch has a clavicle, and the paired fins, when present, are supported by rays. Those having soft rays are called *malacopterygii*; those having spinous rays are called *acanthopterygii*. Besides the paired fins there is a variable number of unpaired integumentary expansions known as median fins, which when fully developed consist of one, two, or three fins on the back, called dorsal fins, one at the posterior end, called the caudal fin, and one or two on the ventral surface, called anal fins. The spines of the caudal fin are set vertically, and not horizontally, as in *cetacean*, and in all the bony fishes the form is said to be homocercal, that is, consisting of two equal lobes, but this is not strictly true, as the tail is generally not quite symmetrical, although not so manifestly unsymmetrical as in the cartilaginous fishes, sharks, and rays. The median fins are always supported by joints upon a series of interspinous bones whose spines pass inward and are attached to the spinous processes of the vertebrae. The heart contains two chambers, an auricle and a ventricle, and the branchial artery has its base developed into a *bulbus arteriosus*, which, however, has no striated muscular fibers, is not rhythmically contractile, and is only separated from the ventricle by a single row of valves. The respiratory organs are in the form of free, pectinated, or tufted branchiae, situated in two branchial chambers, each of which communicates internally with the pharynx by a series of clefts, and opens externally by a single aperture or gill-slit, protected by a bony gill-cover, beneath which there is a branchiostegal membrane, supported upon branchiostegal rays. The branchiae are supported by a series of bony arches, usually five on each side (the anterior four only bearing gills), which are connected below with the hyoid bone, and above with the skull. The nasal sacs never communicate posteriorly with the pharynx. These fishes are generally covered with horny cycloid or ctenoid scales overlapping each other, and forming what is called an exoskeleton, but these scales are sometimes absent, or represented by plates of true bone, which are sometimes ganoid, that is composed of an inferior layer of true bone covered by a superior layer of polished enamel; and sometimes formed of shagreen-like bony spines. The stomach is capacious; pyloric caeca are present. An air-bladder may or may not be present, and may or may not communicate with the gullet. The subdivisions of the osseous fishes are numerous, and comprise a great number of families which cannot be enumerated here.

The suborder *malacopteri*, or soft-rayed division, always have an air, or swim-bladder, which communicates with the oesophagus by a duct which is regarded as homologous to the wind-pipe of air-breathing animals having lungs. The skin is sometimes naked, but is usually covered with cycloid scales, sometimes with ganoid plates. The *malacopteri* are divided into two groups, the *apoda* which have no ventral fins, and contain the eel (q.v.) including the *gymnotus* (q.v.); and the *abdominalia*, having ventral fins, containing the pikes (q.v.) of the *esocidae* (q.v.); the carp (q.v.), chub (q.v.), roach (q.v.), minnow (q.v.), of the family of *cyprinidae* (q.v.); the various species of salmon and trout (q.v.) of the *salmonidae* (q.v.).

The suborder *acanthini* have fins which are always supported by soft rays, while the ventral fins are either wanting, or if present, are under the throat, below or anterior to the pectoral fins, and supported by the pectoral arch. The swim-bladder is sometimes absent, but when present does not communicate, as in the preceding order, with the oesophagus by a duct. This suborder is also divided into two groups, by the presence or absence of ventral fins—*apoda* and *subbrachata*. The most familiar example of the *apoda* is the sand-eel (*ammodytes*) see LAUNCE, *ante*. The subbrachata contain the two important families, the *gadidae* (q.v.), or cod family, comprising the cod (q.v.), haddock (q.v.), ling (q.v.), etc., and the *pleuronectidae* (q.v.), or flat fishes (q.v.), comprising the sole (q.v.), plaice (q.v.), halibut (q.v.), brill (q.v.), turbot (q.v.), etc.

The suborder *acanthopteri* have fins in which one or more of the first rays are unjointed, inflexible, and spiny, and as a rule the exoskeleton being composed of ctenoid scales. The ventral fins are generally beneath or in advance of the pectorals, and the duct of the air-bladder is always absent. This suborder is divided into *pharyngognathi* (q.v.) having the inferior pharyngeal bones ankylosed to form a single bone; and *acanthopteri veri*, characterized by always having spiny rays in the first dorsal fin, and usually in the first rays of the other fins, while the inferior laryngeal bones are never ankylosed into a single mass. This division is perhaps the most typical of the teleost fishes containing the *percidae*, see PERCH, *ante*; the *mugilidae*, see MULLET, *ante*; the *scomberidae* (q.v.), see also MACKEREL, *ante*; the *gobiidae*, see GOBY, *ante*; the *blenniidae*, see BLENNY, *ante*; and the *lophiidae*, see ANGLER, *ante*. The *percidae* is the

most important family, and distinguished by having ctenoid scales, teeth on the palate and vomer, as well as on the jaws, and having from five to seven branchiostegal rays.

The suborder *plectognathi* are characterized by having the maxillary and premaxillary bones immovably connected on each side of the jaw. The endoskeleton is only partially ossified, and the vertebral column remains permanently cartilaginous. The exoskeleton is in the form of ganoid plates, scales, or spines, and there are generally no ventral fins, and the air-bladder has no duct. The most remarkable fishes of this subdivision are the trunk fishes (q.v.). See also *OSTRACION*, *ante*.

The suborder *lophobranchii* (q.v.) is a small group, characterized by a peculiar structure of the gills, which are arranged in little tufts upon the branchial arches instead of in comb-like plates, as in the typical bony fishes. The endoskeleton is only partially bony, but the exoskeleton is composed of ganoid plates, and the air-bladder has no duct. Belonging to this suborder are the sea-horses or *hippocampidae*, see *HIPPOCAMPUS*, *ante*; and the *syngnathidae*, see *PIPE-FISH*, *ante*.

TELEPHONE. This instrument is designed to convey sounds to a distance by means of electricity. In 1860 Reis of Frankfort first recognized the principle of the telephone, using a membrane which, vibrating under the action of sound, caused pulsations of electricity to pass along the wire, and actuated the armature of an electro-magnet, which, mounted on a sounding-board reproduced a sound corresponding in pitch and rhythm with the original. The quality of the sound was however entirely lost. There are several claimants for priority in the discovery of the principle of the articulating telephone, and the discoveries of Gray of Chicago, and Graham Bell, an Edinburgh gentleman resident in America, appear to have been nearly contemporaneous, and attained by different lines of study. The articulating telephone of Bell, which was first shown at the Philadelphia Centennial exhibition, is now of very simple construction. A small bar magnet, with a coil of wire over one end, is placed close behind a diaphragm of ferro-type, the whole being inclosed in a case furnished with a mouthpiece. Words spoken into the telephone are reproduced faithfully on a similar instrument at great distances, and by use of the microphone (q.v.) the most minute sounds have been distinctly heard and even magnified. Many extraordinary results have been achieved in conveying and reproducing sounds, and self-caught sounds from "induction" in the wires have produced interesting results. While the telephone is already very largely used in America for domestic and business communication, it has been less successful in Britain, the busier lines increasing the difficulties of induction. Three requirements appear to be demanded to bring the telephone into general use, namely, a simple and reliable call or *avertisseur*, an increase of the sound to render it unnecessary to hold the telephone to the ear, and the removal of induction currents. Various methods for accomplishing each of these ends are now (1879) proposed, but the difficulties are not yet wholly overcome. A controversy exists whether the sounds in the receiving telephone are vibratory or molecular, or a combination of both.

TELEPHORUS, a genus of coleopterous insects, of the suborder *pentamera*, and section *sericornes*. The body is long, narrow, depressed, soft, and somewhat flexible. The species are numerous, and some of them abound in Britain in summer, chiefly in meadows and pastures. The larvæ dwell in moist earth, and devour small insects and their larvæ. The perfect insect feeds on similar food.

TELERPETON, a remarkable genus of fossil reptiles, the relics of which have been found in fine-grained whitish sandstone quarried at Cummington, near Elgin. A single species, or rather a single specimen, is all that as yet has been detected. It exhibits the skeleton complete, with the exception of the termination of the tail, but the bones have disappeared, and left only the casts as dark-colored cavities in the pale gray rock. Nearly perfect casts of their form were taken by Dr. G. Mantell from these hollow casts. The impressions are so well defined as clearly to show that there were twenty-six vertebrae between the skull and the sacrum, two sacral vertebrae, and a portion of the tail preserved on the slab consists of thirteen others. The ribs, of which there are twenty-one pair, are very slender; they are short near the head, but quickly lengthen as they leave it. The reptilian nature of this fossil is evident. By Dr. Mantell it was considered to be a batrachian, and described as *telorpeton Elginense*; but prof. Owen has more correctly referred it to the lacertine type, because of the numerous ribs, the structure of the sacrum, and the form of the pelvis. He has named it *leptopleuron lacertium*. It has been matter of debate whether the rocks in which the telorpeton was found belong to the old red sandstone measures or to the trias.

TELESCOPE (Gr. *têle-skopos*, far seeing) consists essentially of a lens or mirror, to form, within our reach, an image of a distant object; and a microscope (q.v.), to examine this image in detail. Its invention is ascribed to various individuals living about the end of the 16th c.; but there is no doubt that Galilei (q.v.) was the first to apply it to any purpose other than the gratification of mere curiosity.

The space at our disposal will not allow of our entering into any minute details, so we propose to give: *first*, a general idea of the mode in which a telescope acts, in the course of which we shall incidentally show how the magnifying power and the brightness of the image depend on the dimensions of the various parts of the instrument; *second*, to point out the various causes of imperfection, which in all telescopes are

unavoidable, and how these are reduced to as small an amount as possible; *third*, to mention the most important of the many forms which have been devised, and the processes by which these delicate instruments are practically constructed.

When a lens is employed, as in a camera obscura, to form an image of an object, as AB in fig. 1, the distance of the image from the lens depends on the focal length of



FIG. 1.

the lens, and also on the distance of the object. Practically, with telescopes, the distance of the image from the lens is, on account of the remoteness of the object, the focal length of the lens. Also the image of any point, A , of the object lies in the prolongation of the line joining A with the center, C , of the lens. Join AC , and produce it to a , Ca being made equal to the focal length of the lens, a is the point at which the image



FIG. 2.

of A is formed. Similarly at b the image of B is formed. Thus the image is *inverted*; and, seen from C , the image and the object subtend equal angles, or look equally large. When a concave mirror forms an image, the effect is as in fig. 2, where C is now the center of the sphere of which the mirror is a portion. When the object, AB , is at a great distance, the image, ab , is *inverted*, and is formed half way between C and the mirror. As before, object and image subtend equal angles at C . In order to see these images, the eye must be placed at some such point as E in each of the figures.

So much for the formation *within our reach* of an image of a distant body. We must next show the action of a lens when employed to magnify this image. When an object, as ab in fig. 3, is placed rather nearer to a lens than its focal length, rays which pass from the object through the lens appear to have come, not from the object, but from an enlarged image as $\alpha\beta$, at a greater distance from the lens—but subtending, as before, the same angle at the center, c , of the lens. In practice, the lens is so adjusted as to form the image, $\alpha\beta$, at a distance of about 10 in. from c , in which case the eye sees it most distinctly, and the distance of ab from the lens is then (practically) the focal length of the lens.

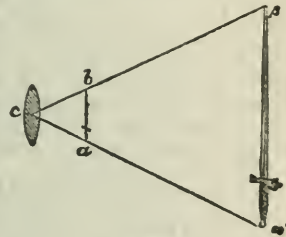


FIG. 3.

We now combine the first and third diagrams, and we have the *common astronomical telescope*. The magnifying power is obviously to be measured by the increase in the angle which is subtended by the image $\alpha\beta$ (fig. 4), over that which is subtended by the object, AB . The angle at C is the measure of the apparent size of the object; that at c , of the apparent size of the image. And it is easy to see from the quadrilateral $Ca\beta b$ in the figure that these angles are inversely as the sides Ca and ac . (For instance, if Ca have six times the length of ac , the angle at C will be only one-sixth of that at c .) Hence the magnifying power is to be found by dividing the focal length of the object-lens by that of the eye-lens. In practice, the lenses are so mounted in tubes that their distance may be increased or diminished at pleasure. When the object, AB , comes nearer the observer, its image, ab , is formed *further* from the lens C . Hence, for near objects, the telescope requires

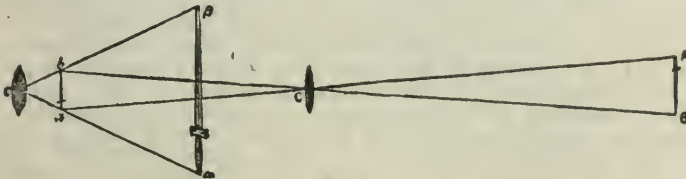


FIG. 4.

to be pulled out. Again, the distance of most distinct vision differs for different people, so that even when AB is at a fixed distance, short-sighted and long-sighted eyes require the eye-lens to be removed from, or advanced to, ab , so that for each eye $\alpha\beta$ may be formed at the distance at which it can be most distinctly seen.

To estimate the relative brightness of the image and object, suppose, for simplicity, all the light which enters the telescope from the object to reach the eye. Then the quantity of light which enters the eye from the image is greater than that which would enter the unaided eye from the object, in the ratio of the aperture of the object-glass, C, to the aperture of the pupil of the eye. But it is spread over a magnified image. If the image be as much larger than the object as the object-glass is larger than the pupil of the eye, the object and image will appear equally bright. Taking the aperture of the pupil as $\frac{1}{10}$ in., the object-lens would require an aperture of 10 in., with a magnifying power of 100 times, in order that brightness should not be lost. Practically, the most formidable difficulty in attaining very high magnifying powers is that due to the enormous size of lenses and mirrors which are required to give the necessary brightness to the enlarged image. It is easy to see that it is impossible to render the final image brighter than the object by any increase of dimensions in the object-lens.

After what we have said about the common astronomical telescope, the reader will have no difficulty, from a combination of figures 2 and 3, in understanding the construction of the Newtonian or Herschelian reflecting telescope.

We proceed to the second part of our proposed scheme of treatment of the subject, viz., the unavoidable imperfections of the telescope, and their reduction to a minimum.

In the first place, then, even with a mirror—where we are not annoyed by the breaking up of white light into its component colors, since the law of reflection (q.v.) is the same for all rays—it is impossible to form a perfectly sharp image of more than one definite point at a time. In order to do even this, the mirror must be formed as part of the prolate spheroid produced by the rotation, about its longer axis, of an ellipse (q.v.), one of whose foci is the object-point, the other the image. If the object-point be, like a star, practically at an infinite distance, the requisite form of the mirror is that formed by the rotation of a parabola (q.v.) about its axis. The axis of the mirror must then be directed to the object-point, and all rays from it will, after reflection, pass accurately through the focus. But this is not strictly true for any other object-point in the field of view, although so nearly true that no inconvenience is practically found to result from it. But, if the mirror used be part of a sphere, no point can be found such that rays diverging from it shall all be brought after reflection accurately to one point of the image; and this defect, called *spherical aberration*, increases proportionally to the surface of the mirror; so that by increasing that surface, for the attainment of brightness, we increase proportionally the indistinctness of the image. To give an idea of the delicate manipulation required in the construction of a reflecting telescope, we take the case of a speculum of 4 ft. aperture and 40 ft. focus, as calculated by sir J. Herschel. If this be first ground to a truly spherical form, it must have a radius of 80 ft., as we have seen above. Now, such a mirror will give a very indistinct image, even under the most favorable circumstances; yet to grind it to the parabolic form, which is practically perfect, leaving the middle untouched, and grinding more and more away from its surface as we proceed outward to the edges, even at the edges we have to remove a film of metal of only the $\frac{2}{11333}$ part of an inch, somewhere about the $\frac{1}{100}$ part of the thickness of the paper on which this is printed!

Lenses, whether the object-lens or the eye-lens, have this defect also; but, as a rule, the spherical aberration in lenses is almost negligible compared with *chromatic aberration*, which arises from the different refrangibilities (see REFRACTION) of the various colored rays; and leads to the formation, by a lens, of a separate image of a bright object for each colored ray. The remedy consists in *achromatizing* (see ACHROMATIC, REFRACTION) the lens—i.e., forming it of two or more lenses of different kinds of glass—so that the colors, separated by one, shall be reunited by the others. With a double achromatic lens, in which a convex lens of crown glass is united to a concave of flint-glass, the focal lengths of the separate lenses can be easily adjusted so as to bring, when in combination, any two assigned rays of the spectrum (q.v.) simultaneously to a focus; and, by a judicious selection of these two rays, we may reduce the consequences of irrationality of dispersion (See REFRACTION) to a minimum. But this is not all. To construct a lens of a given material which shall have a given focal length, is an *indeterminate* problem; we may assign the curvature of either surface at pleasure, and then that of the other is definite, and can be calculated. Thus, the achromatism of a double-lens can be secured in an infinite variety of ways, and we may impose further conditions; i.e., that the curvatures of the convex and concave surfaces shall be adjusted so as to destroy to as far as possible the spherical aberration. Other imperfections, such as those due to (q.v.), etc., cannot be here more than alluded to, as they do not admit, within any reasonable limits, of being popularly explained. Nor can we enter upon questions connected with the correction of chromatic and spherical aberrations in eye-pieces, which is effected by the combination of two or more lenses (generally of the same material) placed at a certain distance from each other. We may only mention that the defect (for terrestrial purposes) of the common astronomical telescope, the inversion of the image, is overcome by combining two such telescopes, the smaller to examine the image formed by the larger, and therefore to reinvert it. This practically comes to constructing the eye-piece of three lenses at a distance from each other; though, for greater distinctness, four are usually employed.

In the earliest, or Galilean, telescope, the eye-lens is concave; a construction only

now used in opera-glasses. It has far less chromatic and spherical aberration than the common astronomical telescope, and is shorter, since the distance between the lenses is the *difference*, not the *sum* of their focal lengths; but it has a very serious defect in the smallness of its field of view. This can only be enlarged, as in opera-glasses, by making the diameter of the object-lens disproportionately great.

Before the discovery of the possibility of forming an achromatic lens, Huygens, Cassini, and others, had endeavored, by enormously increasing the focal length of the object-glass of the common astronomical telescope in proportion to its diameter, to get rid as far as possible of chromatic aberration. This was called the *ærial* telescope, as the object and eye-lenses were mounted separately on stands; the tube (which would have been 100 200, or even 600 ft. long) being dispensed with. Valuable work was done with some of these telescopes, of 125 ft. focus, but the longer ones proved unmanageable. The principle involved in these constructions is, practically, the throwing the magnifying power more on the object-lens than on the eye-lens; as the image formed by the former was still so imperfect as not to bear much additional magnification; although achromatic eye-pieces could even then be made with one kind of glass. The great step required for shortening the unwieldy instrument was therefore the perfecting of the object-lens. We have already seen how this was effected. Various very ingenious improvements on achromatic combinations, even yet (we should be inclined to think) worthy the consideration of opticians, were devised by Dr. Blair. He obtained in solutions of mercury or antimony in hydrochloric acid, media, in which, while much more refractive and more dispersive than crown-glass, no irrationality of dispersion as compared with crown-glass could be detected. With these fluid lenses he was enabled to give the telescope an aperture of $\frac{1}{2}$ of its focal length without a trace of residual color. The *dialytic* telescope, invented in 1828 by Mr. Rodger, and since made by Plössl, seems to promise very well. Its object is to obtain a large aperture for the telescope with a flint-lens (the obtaining of which, in large and perfect disks, is the great difficulty) of moderate size. In this telescope the object-lens is single, and of crown-glass; having, of course, all the defects of the single lens. These are corrected, at some distance in the cone of converging rays, by the interposition of a combination of a pair of much smaller lenses, whose focal lengths are equal for red rays; the first being a convex lens of crown, the second a concave of flint glass. The adjustments of this instrument for exact correction are, a motion of the pair of lenses to or from the object-lens, to correct chromatic aberration; and a change of the distance between the two smaller lenses, to correct spherical aberration.

Chromatic being so much more serious than spherical aberration, it is not to be wondered at that the idea of substituting an object-mirror, in which the former is absent, for an object-lens, was early suggested. The first practicable scheme for the purpose seems to have been that of Gregory; in which, however, two mirrors are employed. In the skillful hands of Short, this instrument completely superseded the ordinary astronomical telescope. Its chief defects are, the great loss of light by two direct reflections, and the increase of the spherical aberration by the fact that both mirrors are concave. The first defect is incurable, the second was partially overcome by Cassegrain's plan of using a small *convex* mirror for the second reflection. To Newton is due the simple idea of using the combination of a single curved mirror with a plane mirror and an eye-piece; a construction differing only in slight particulars from that now universally adopted for reflecting instruments. Newton constructed several such telescopes with his own hands, some of which are still preserved, as in the apartments of the royal society at Burlington House.

The elder Herschel constructed for himself all the instruments, gradually increasing in magnitude the optical power, by means of which he made his grand discoveries; and his son worthily succeeded him, both as constructor and observer.

The gigantic telescopes of lord Rosse and Mr. Lassell are wonderful examples of delicate art, and have had their full share, with the large achromatics of the present day, in the startling discoveries of modern astronomy.

The process of Liebig for depositing on glass an exceedingly thin film of silver, which, by careful polishing, can be rendered more highly reflective than any other material, has been taken advantage of by Steinheil in the construction of large specula. This is an immense step, since any disk of glass will do, its optical properties not being employed; while, if it be once brought to a true parabolic figure, the silvering may be renewed as often as may be required. One of the great difficulties in the construction and working of large reflectors has hitherto been the casting and annealing of metallic masses of a few tons' weight. This, in the silvered specula, is entirely avoided. We cannot here enter into a description of the processes, often extremely ingenious, which have been devised for the grinding, figuring, and polishing of lenses and specula. The reader who desires strictly scientific information, conveyed in a thoroughly popular form, on this and all other points connected with the subject, is referred to sir John Herschel's article "Telescope," in the *Encyclopædia Britannica*, to which we have been largely indebted, and which has been reprinted in a separate form.

TELFAIR, a co. in s. Georgia, drained and bounded by the Ocmulgee and Little Ocmulgee rivers; traversed by the Macon and Brunswick railroad; 925 sq. m.; pop.

'80, 4,828—4,816 of American birth; 2,163 colored. The soil is sandy and covered with pine forests; corn, sweet potatoes, and cotton are the staples. Co. seat, Jacksonville.

TELFORD, THOMAS, an eminent engineer, was b. in the parish of Wester Kirk, in Eskdale, Dumfriesshire, Aug. 9, 1757. His father was a shepherd; and during the intervals of his attendance at school, young Telford followed the same occupation, diligently employing his leisure moments in the perusal of whatever books were within his reach. At the age of 14, he adopted the trade of a stone-mason; and long years afterward, when he had attained the summit of his profession, he confessed the advantages which he derived during this period from "the necessity of making himself acquainted with every detail in the procuring, preparing, and employing of every kind of material, whether it be the produce of the forest, the quarry, or the forge." In 1780 he removed to Edinburgh, and in 1783, he repaired to London, obtaining employment under sir William Chambers, who was then engaged on his chief work, the erection of Somerset house. Telford's merits attracted the notice of his employer, and he was appointed in 1784 to superintend the erection of the resident commissioner's house at Portsmouth dockyard, a work which lasted over three years, and afforded Telford the opportunity, of which he fully availed himself, of mastering the details of construction of docks, wharf-walls, etc. In 1787, he was appointed surveyor of public works for Shropshire; and his two bridges over the Severn at Montford ($3\frac{1}{2}$ m. w.n.w. of Shrewsbury) and Buildwas ($1\frac{1}{2}$ m. w. of Coalbrook Dale), a large number of minor bridges, and other county works, testified to the genius and industry of the rising engineer, and gained for him the planning and superintendence of the projected Ellesmere canal, 103 m. in length, to connect the navigation of the Severn, Dee, and Mersey—a work which occupied 10 years (1795–1805), and greatly added to the already eminent reputation of Telford. In 1790 he was appointed by the British fishery society to inspect the harbors at their various stations, and in 1801 he received a commission from government to report on the state of Scotland, and on the desirable public works for that country. As a consequence, the plan of a canal from Inverness to Fort-William was revived, and its planning and construction intrusted to Telford (see CALEDONIAN CANAL). In the same capacity of engineer to the parliamentary commission of roads and bridges for Scotland, he executed more than 1000 m. of road in the Highlands, Lanarkshire, and Dumfriesshire (see ROAD-MAKING), and erected about 1200 bridges, besides churches, manses, harbors, etc. In 1808, and again in 1813, he was invited to Sweden, to report on the projected scheme for connecting lake Wener with the Baltic, and superintended the construction of the Gotha canal, by which this was effected; receiving on his departure numerous and valuable marks of the royal approbation. His next great work was the construction of the road from London to Holyhead, including the erection of numerous bridges—among others, of the Menai *suspension bridge* (q.v.)—and the last was the execution of the St. Katharine's docks in London, a work of remarkable merit. His other works are far too many to enumerate. We can only afford to state that, of bridges, the Conway (q.v.), the Broomielaw at Glasgow, the Dean in Edinburgh, the Over at Gloucester (an innovation on the ordinary form); of canals, the Glasgow and Paisley, the Macclesfield, the Birmingham and Liverpool junction, the Gloucester and Berkeley, the Weaver system, the great tunnel ($1\frac{1}{2}$ m. long) on the Trent and Mersey; of harbors, Peterhead, Banff, Fraserburgh, Fortrose, Cullen, and Kirkwall—were planned by this indefatigable genius, and wholly or partially erected under his superintendence. He was much employed by parliament to report on all public engineering schemes or works of importance, and was also occasionally consulted by the Russian government. For the last few years of his life, he retired from the active duties of his profession, employed himself in collecting and arranging materials for a complete history of his various works, and had the greater portion of the MSS. ready when he was seized with a severe bilious attack, and died at Abingdon street, Westminster, Sept. 2, 1834. His life, entitled *The Life of Thomas Telford, Civil Engineer, written by himself*, was published in 1838, in 1 vol. 4to, accompanied with a companion volume of plates. While a mason in Dumfriesshire, he was known favorably as a writer of short poems, in the homely dialect of his district, which are to be found in the appendix to his autobiography. He completed his imperfect school education during the intervals of business, becoming an excellent linguist, and contributed to the *Edinburgh Encyclopædia*. He was elected a member of the Royal society of Edinburgh in 1803, and of its more eminent southern sister in 1827.

TELL, a district in the extreme n.w. of Africa, stretches along the shores of the Mediterranean, and comprehends the corn-growing tracts extending s. from the Mediterranean to the Atlas mountains, and from w. to e. through Morocco, Algeria, and Tunis. The Tell is noticed under the articles Africa and Sahara (q.v.).

TELL, WILLIAM, was, according to Swiss tradition, a patriot who, in the 14th c., rescued his native district from the tyranny of the house of Austria. His story has been variously told, but that version which has found the widest currency is the following. In the beginning of the 14th c., Albert I. of Austria was striving to annex the three Waldstädte, Uri, Schwyz, and Unterwalden, to his family estates. Hermann Gessler, his bailiff (or *Landvogt*), lived at the castle of Küssnacht, and perpetrated on the people of the district the most atrocious cruelties. A league was formed of the principal men of the Waldstädte to resist the Austrian pretensions, and to it belonged Walter Fürst, and William

Tell, his son-in-law. Among other acts of tyranny, Gessler placed the ducal hat of Austria on the top of a long pole, erected in the market-place of Altorf, and gave orders that no one should pass without uncovering his head. Tell and his little boy one day took no notice of the hat, and were at once dragged before Gessler. He, hearing that Tell enjoyed great reputation as a cross-bowman, resolved to make his skill a means of punishing him. He was ordered to shoot an apple from his son's head, and told that if he missed it, he should die. To the amazement of all present, he hit the apple without injuring the child. But this did not satisfy Gessler. Turning to Tell, he asked him what he meant to have done with a second arrow he had in his girdle. "To have shot you if it had slain my son," was the reply. Tell was then seized, bound, and thrown into a boat on the lake of Lucerne, to be taken with Gessler and his men to the castle of Küssnacht. A sudden Alpine storm sprung up. Tell was the only man on board who knew the shore, and could manage a boat in such weather. He was allowed to take the helm, and he soon ran her toward a rocky ledge; he there seized his bow and arrows, sprang on shore, and pushed the vessel back into the water. The storm, however, abated, and Gessler and his party landed. Tell lay in wait for them in a rocky defile and as they passed, he shot Gessler through the heart. This befell in 1307, and was followed by the great Swiss war with Austria—the first of a series which lasted till 1499—in which, however, Tell took no prominent part. Tell was drowned, it is added, in 1350, in attempting to save a friend during a great flood of the river Schächen.

There is evidence that, in 1387, a religious service was instituted to commemorate the act of Tell at the place where he lived; and that, in the following year, Tell's chapel was built on the spot where the boat was said to have landed. Russ and Eterlin, chroniclers who lived toward the end of the 15th c., told his story as true history. Tschudi, who wrote in the first part of the 16th c., repeated it in the form in which it is now familiar to us, and in which it was adopted by Schiller, in his well-known drama. So early as the end of the 16th c., however, doubts were expressed of its authenticity. Guilmann, who wrote a book, *De Rebus Helveticis*, called in question the very existence of Tell. What, he asks, has become of his family and relatives? Why was he not spoken of by his contemporaries? Grasser, the author of a Swiss *Heldenbuch*, pointed out a striking resemblance between Tell and Toke, the hero of an old Scandinavian fable, recorded by Saxo Grammaticus. From that period, incredulity became general, and several books were published to show that the story was legendary. One of these, *Guillaume Tell; fable danoise*, was burned by the public hangman at Uri, and then a patriotic feeling was manifested on the subject, which, it is believed, made Swiss writers, including J. von Müller the historian, cautious in expressing farther doubt. Voltaire, in speaking of Tell, makes the remark, that "*l'histoire de la pomme est bien suspecte*," and asserts that no part of the tale had a foundation in fact. His opinion became known all over Europe; and since then, a whole library has been published on the story of Tell, in Switzerland, Germany, Denmark, and France. The most important works, however, bearing on the question, are (1) Ideler's work, *Die Sage vom Scheusse des Tell*, published at Berlin in 1826, in which it is shown that the incident of the apple is purely legendary; (2) an edition of Russ's chronicle, edited in 1834, by M. Schneller of Lucerne, in which it is proved that serious disparities exist between the different versions of the story as told by the Swiss chroniclers; and (3) a work containing a series of documents relating to early Swiss history, published in 1835 by M. Kopp, also of Lucerne, in which it is as satisfactorily shown that, although a continuous series of charters exist relative to the bailiffs of Küssnacht in the 14th c., there is no Gessler among them. Tell is nowhere mentioned in contemporary records; but it need not, therefore, be inferred that an obscure peasant did not exist of the name, who shot an Austrian bailiff on the banks of the lake of Lucerne, who by this act caused a revolt, and who lost his life in attempting to save that of a friend. If such incidents really occurred—and from the early foundation of Tell's chapel, and other facts connected with it, we must presume they did—it would be easy to explain how they became connected with the old fable of the tyrant, the bowman, and the apple.—Ample information on the Tell controversy will be found in Hisely's *Recherches* (1843); and Vischer's *Die Sage von der Befreiung der Waldstädte* (1867).

TELLEZ, GABRIEL, better known by his literary pseudonym of *Tirso de Molina*, a Spanish dramatist of great reputation, was b. at Madrid in 1585, became a monk in 1620, and died in 1648, prior of the order to which he belonged. Tellez was a friend and pupil of Lope de Vega, whom he almost rivaled in facility of execution. In the preface to his *Cigarrales de Toledo* (1621), a collection of novels and comedies, he reckons the number of the latter composed by him at 300; of which, however, only 68 have come down to us. Besides these, he wrote several interludes, a great number of *Autos Sierumentales*, an *Acto de Contricion en Verso*, and a *Genealogia de los Condes de Sistago* (Mad. 1640). Tellez ranks next to Calderon and Lope de Vega as a dramatist. Although he generously affected to consider himself only a follower of the latter, he is really one of the most decisively original geniuses of his country, and imitated Lope in nothing except in cultivating the same national spirit in literature. His plays, deficient in artistic conception, are full of dramatic vitality. The "situations" are numerous and captivating, the delineation of character fresh, piquant and vigorous; the wit abundant,

and the language richly poetical.—The best edition of Tellez's works is that of Don Juan Eugenio Hartzenbusch, in the *Teatro Escogido* (12 vols., Madrid, 1839-42).

TELLICHERY, a sea-port t. and military station of British India, in the district of Malabar, 90 m. s.w. of Seringapatam. The site of the town is very beautiful, and the neighboring country highly productive, the low lands producing two, and in some cases three, crops of rice in the year. The cocoa-nut tree also grows in great abundance, and is put to many uses by the inhabitants. On account of its salubrity, Tellicherry has been called the Montpellier of India. There is a natural breakwater abreast of the fort, formed by a reef of rocks running parallel to the shore, having a depth within suitable for ships of 500 or 600 tons. Pop. '71, 20,504.

TELLING FORTUNES is a criminal offense when accompanied with begging of money or with fraudulent objects. Every person going about pretending or professing to tell fortunes, or using any subtle craft, means, or device, by palmistry or otherwise, to deceive and impose on her majesty's subjects, is deemed in law a rogue and vagabond, and may be committed to the house of correction for three months, with hard labor, by a justice of the peace.

TELLINIDÆ, a family of lamellibranchiate mollusks; having the mantle widely open in front; the foot tongue-shaped; the siphons separate, long, and slender; the shell usually equivalve and shutting close, the hinge toothed. The species are very numerous, and are found in almost all seas, mostly living in sand or sandy mud, some of them at a considerable depth. The fossil species are also numerous, and are found in the more recent formations. The genus *donax* belongs to this family.

TELLURIUM (symb. *Te*, equiv. 64—new system, 128—spec. grav. 6.183) is a chemical element, which some authorities place among the metals, and others among the non-metallic bodies or metalloids. Although in its outward characters it closely resembles the metals, its close analogies with sulphur and selenium indicate that its true place is among the metalloids. It possesses a high metallic luster, and resembles bismuth in color; it fuses at about 850°, and at a higher temperature is converted into a yellow vapor; it is a bad conductor of heat and electricity. When strongly heated in the air it burns with a blue flame, and gives off white fumes of tellurous acid. Like sulphur and selenium, it is soluble in cold oil of vitriol, to which it gives a fine purple-red color, and on dilution it is precipitated unchanged; and in these respects differs from all metals. In nitric acid it dissolves with oxidation.

Tellurium forms two compounds with oxygen, viz., *tellurous acid*, TeO_2 , and *telluric acid*, TeO_3 . *Tellurous acid* exhibits very slight acid properties, and in the anhydrous state it combines with acids, and acts the part of a weak base. These salts have a metallic taste, and are said to act powerfully as emetics. The *telluric acid* has only a feeble affinity for bases, but it forms salts, which contain 1, 2, and 4 atoms of the acid to each atom of base. Tellurium unites with hydrogen to form tellureted hydrogen, TeH , which is a gaseous body, analogous to sulphureted hydrogen, and precipitates most of the metals from their solutions in the form of tellurides, which have a close analogy with the corresponding sulphides.

In experimenting upon the action of the salts of tellurium, it has been found that they possess the power of forming, in the body of a healthy person, compounds which impart to the breath, to the perspiration, and to the gases generated in the intestinal canal, a disgusting fetor, which makes him a nuisance to every one he approaches; and this smell may last for weeks, although the quantity of tellurium that was administered did not exceed a quarter of a grain.

Tellurium is a rare substance, found chiefly in Transylvania, but recently discovered in Hungary, in North America, and in the Altaí silver mines. It sometimes occurs native, but more commonly as a telluride of gold, lead, or silver. For the method of extracting it, we must refer to any of the larger works on chemistry, and especially to the *Lehrbuch* of Berzelius. It was discovered in 1782 by Müller von Reichenstein, but it was not till 1798 that its properties were accurately studied by Klaproth. The word tellurium is derived from the Latin *tellus*, the earth.

TEMBU (Abatembu, or Tambookie) is the name of an important tribe of Kaffirs, occupying the region e. of the present boundary of the Cape Colony, where it forms the eastern limit of the district of Queenstown, formed by sir Harry Smith in 1849-50, a rather elevated plateau, from which flow the head-waters of the Kei, Bashee, Tsomo, and other important rivers. They number about 90,000 souls, and are of a less warlike and predatory nature than the adjoining tribes of the Amaxosa and Amagaleka Kaffirs. In the earlier Kafir wars, and even in the great one of 1835-36, the Tambookie Kaffirs remained neutral, and even friendly to the colonists; but in the war of 1848-49, they were induced to join the other tribes, and were defeated with great loss by a small colonial force. In the war of 1851 they were much broken and scattered; but eventually submitting to the British authority, they have quietly located themselves in the unoccupied country e. of the White Kei and Tsomo rivers, a good pastoral region, but rather bare of wood. Wesleyan missionaries have several stations among the Tambookie tribe, and many of them exhibit very pleasing features. A British resident, paid by the Cape Colony, also resides among them.

TEMES, a co. in s.e. Hungary, in the trans-Tibiscan circle; 2,289 sq.m.; pop. '70, 356,174. It is drained by the Temes and Bega rivers. The soil is very fertile, producing wheat, corn, hemp, flax, fruit, cotton, and grapes from which much wine is made. The silk-worm is raised, and great numbers of cattle. Capital, Temesvár.

TEMESVÁR, a Hungarian city, seat of the commander of the Banatish-Servian military frontier, is a strongly fortified place on the Bega canal, and is about 300 m. s.e. of Vienna, with which it is connected by railway. The town is fortified with a triple wall and moat, and has four suburbs. Of the population about a half are German, only a seventh being Magyar, and the rest Rumanians, Jews, and Servians. In Temesvár are a fine cathedral, an ancient castle, a magnificent episcopal residence, an armory, barracks, and a theater. There are manufactures of cloth, silk, paper, and oil, and a brisk transit trade in grain, wax, honey, and brandy, with Transylvania, Servia, and Rumania. Temesvár has endured a vast number of sieges—the latest being that of 1849, when it was bombarded for 107 days by the Hungarian insurgents, but was relieved at the end of that time by marshal Haynau. Pop. '69, 32,223.

TEMISCOUATA, a co. in e. Quebec, Canada, bordered n.w. by the St. Lawrence river, and s. by New Brunswick and Maine; 1770 sq.m.; pop. '70, 22,491. The surface is mountainous. Co. seat, Isle Vert.

TEMPÉ, a narrow valley or gorge, about 4½ m. long, in the n.e. of Thessaly, between Olympus (q.v.) and Ossa (q.v.), through which flows the river Peneus. The classic poets (none of whom, curious to say, appear to have ever seen the glen) praise it for its matchless beauty, and hence the name with them became a synonym for any lovely vale. In point of fact, however, the scenery of Tempé is characterized by wild grandeur rather than by soft sylvan charms.

TEMPERA, in painting, the same as *distemper* (q.v.).

TEMPERAMENT is a term which has been employed in physiology ever since the time of Galen, to designate the certain physical and mental characteristics presented by different individuals. Dr. Todd, in his article on this subject in the *Cyclopædia of Anatomy and Physiology*, observes that "the temperaments the existence of which seems most consistent with observation, are those admitted by Cullen, namely, the *sanguineous* and the *melancholic*, the *phlegmatic* being a degree or modification of the sanguineous, and the *choleric* of the melancholic.

Individuals of the *sanguineous* or *sanguine* temperament are such, according to Cullen, as have the quantity of fluids in the body large in proportion to the solids; the habit of body soft and plump; the skin smooth, white, and readily sweating on exercise; the hair soft, and generally pale, passing from thence to a red tint; the complexion ruddy; the eyes blue; the bodily strength moderate; and the mind sensible, irritable, cheerful, and unsteady. In persons of the *melancholic* temperament, the habit of the body is somewhat hard and meager; the skin and complexion coarse, and of a dun color; the hair hard, curly, and black; the strength considerable; the mind slow, disposed to gravity, caution, and timidity, but tenacious and steady.

Some writers recognize a *nervous* temperament, in which the predominating characteristic is a great excitability of the nervous system, and an undue predominance of the emotional impulses. This temperament is always associated with the sanguineous or the melancholic. In both sexes, the characteristics of the temperaments are far less manifest in old age than in earlier life. If it be admitted, as Dr. Todd believes, that a constant connection exists between color and temperament, it obviously follows that the nature of the temperament is determined by certain peculiarities in the physical condition of the organism. The different temperaments often merge so gradually into one another that it is in many cases difficult to decide positively to which variety any special case belongs.

TEMPERAMENT, in music, a system of compromise in keyed instruments for the avoidance of the necessity presupposed by the strict relation of musical intervals of having a separate row of keys corresponding to each tonic. Taking C as keynote, the ratios of the notes of the diatonic scale, as derived from the number of vibrations in a given time of a string sounding that note (see *MUSIC*), are:

C	D	E	F	G	A	B	C
24	27	30	32	36	40	45	48

The intervals between these notes are by no means equal, and may be thus expressed in numbers by logarithms:

C	D	E	F	G	A	B	C
51	46	28	51	46	51	28	

We have here three species of intervals, of which those represented by 51 are called major tones; those by 46, minor tones; and the smaller intervals represented by 28, semitones. These intervals will evidently only serve with C as keynote. If, for example, we start from D instead of C, we find E a tolerable, though not quite correct, second to D; but the third and seventh of the scale are entirely wrong. Were the major and minor

tones equal, and each semitone exactly half a tone, the insertion of a note in the middle of each tone dividing the seven intervals would make it immaterial where the scale began; any one of the twelve notes becoming alike available as a keynote; and though such equality is contrary to the immutable principles of harmony, an arrangement based on it is found practically to give but little offense to the ear. In what is called the *equal temperament*, the twelve intervals are all of the same length, and no advantage is given to one key over the rest. This is, in theory at least, the temperament adopted in the pianoforte. Another system, known in this country as *Smith's* or the *vulgar temperament*, in which some keys were favored at the expense of others, has been much used in organs. While the keys of B \flat , F, C, G, D, and A are more perfect than on equally tempered instruments E \flat , A \flat , D \flat , and F \sharp contain some very harsh intervals. The bad fifths and thirds which exist in these keys are designated by musicians by the name of *wolf* intervals. This mode of tuning the organ is being more and more abandoned for the equal temperament, or an approximation to it. The different characters of the various keys often observed on the pianoforte, as well as the organ, could have no existence were the temperament absolutely equal, and arise out of the circumstance that this strict equality is not altogether adhered to in practice.

TEMPERANCE. *History of the Movement.*—The origin of the temperance movement dates from the beginning of the present century; and the merit of having taken the first steps in the matter belongs to America, where the vice of drunkenness appears to have reached an alarming height about that time. In the month of April, 1808, a society was established at Moreau, county of Saratoga, in the state of New York, consisting of 43 members; one of whose rules was as follows: "Art. 4. No member shall drink rum, gin, whisky, wine, or any distilled spirits, or compositions of the same, or any of them, except by the advice of a physician, or in case of actual disease (*also excepting at public dinners*), under the penalty of 25 cents, provided that this article shall not infringe on any religious rite." This society had other rules prohibiting members (under penalties) from offering any of the above liquors, or from being intoxicated; but though it continued to exist for 14 years, it does not seem to have accomplished much good. Gradually, however, the attention of the clergy and of philanthropical laymen was called to the subject; and after a series of sermons had been preached and published against a vice whose rapid progress was threatening (according to Dr. B. J. Clarke) to make the Americans "a community of drunkards," a society was started at Boston (Feb., 1826), called *The American Temperance Society*, "to restrain and prevent the intemperate use of intoxicating liquors." In 1829, *The New York State Temperance Society* was formed; and before the close of the year, 1000 local societies, with 100,000 members, were in existence, and a periodical, entitled *The Journal of Humanity*, established to promote the new movement. Rumors of the progress of temperance societies soon reached the old world, and in Aug., 1829, a society was started at New Ross, in the county of Wexford, Ireland, under the auspices of the rev. George Whitmore Carr, the members of which pledged themselves "to abstain from the use of distilled spirits, except as a medicine in the case of bodily ailment;" and further, "neither to allow the use of them in their families, nor to provide them for the entertainment of friends." Simultaneously, a movement in favor of temperance was begun in Belfast and the north of Ireland, by the rev. Dr. Edgar, rev. Dr. Cook, and rev. Mr. Morgan, and before 12 months were over, 60 societies had been constituted, numbering about 3,500 members, both Catholics and Protestants. Meanwhile, Scotland had not been uninfluenced. As early as Oct., 1829, Mr. John Dunlop, of Greenock, a justice of peace for Renfrewshire, after lecturing on the subject of temperance in Glasgow, Sterling, and elsewhere, succeeded in forming a society at Greenock, the first in Scotland, and the precursor of *The Glasgow and West of Scotland Temperance Society*, formed in the ensuing November. Mr. Dunlop is thus entitled to be considered "the father of temperance societies in Great Britain." In his early labors, he was greatly assisted by Mr. William Collins of Glasgow, who became the editor and publisher of the *Temperance Record* (1830-35). The rules of *The Glasgow and West of Scotland Temperance Society* were substantially the same as those of the American and Irish societies—the members voluntarily agreeing "to relinquish entirely the use of ardent spirits, except for medicinal purposes," although "the moderate use of other liquors is not excluded." The zeal and activity of this society were remarkable. According to the report read at the first annual meeting (Dec. 30, 1830), it had circulated in the course of the year 425,300 tracts and 20,200 pamphlets, and numbered in Glasgow alone 5,072 adherents; while it was stated that throughout Scotland at large there were 130 societies, and 25,478 members. It is not necessary to follow further in detail the course of the temperance movement, *strictly so called*, in Scotland, except to remark, that numbers of the clergy now began to interest themselves in it, and at the close of 1831, there were 187 ministers of various denominations in Scotland connected with the cause; but we must now notice the introduction of a new and more stringent application of the temperance principle. On Sept. 21, 1830, Mr. John Davie, and several other members of the temperance society of Dunfermline, pledged themselves to "total abstinence from all intoxicating liquors—small-beer excepted, and wine on sacramental occasions;" and in the course of the next two years, "total abstinence societies" were started in Glasgow, Paisley, and other places. In 1830, the temperance movement

extended to England. Mr. Henry Forbes, a merchant of Bradford in Yorkshire, happening to be in Glasgow on business, had attended one of the meetings of the Glasgow society, became deeply interested, and on his return home took steps to organize a Bradford society (Feb. 2, 1830). Another society was formed at Warrington (April 4, 1830); a third at Manchester (May 12, 1830); and by the close of the year, about 30 temperance societies were in existence, numbering in all 10,000 members. In June, 1831, *The British and Foreign Temperance Society* was organized in London, mainly through the persevering efforts of Mr. William Collins of Glasgow. This was for many years the leading society of the party, its patron being the bishop of London, and its vice-presidents including several other prelates, distinguished officials both civil and military, and a few members of parliament. The pledge taken by its members was simple: "We agree to abstain from distilled spirits, except for medicinal purposes, and to discountenance the causes and practice of intemperance." We have not space to narrate its history and progress in detail, but we may notice that it was instrumental in awakening an interest in the temperance movement both in the army and navy, and that, in the course of a single year (1831-32), it could boast of having induced 400 old Greenwich pensioners to give up their grog!

Gradually, however, the more fervid friends of temperance in England arrived at the same conclusion as the Dunfermline "reformers"—viz., that a crusade against gin and other "alcoholic" liquors was not enough; that "beer" was the great cause of drunkenness in their country, and that nothing but total abstinence from all intoxicating drinks would cure the evil. The movement in this direction first took shape at Preston in Lancashire, in Sept., 1832, when Mr. Joseph Livesey, and some other members of the temperance society there, pledged themselves "to abstain from all liquors of an intoxicating quality, whether ale, porter, wine, or ardent spirits, except as medicines." An active propagandism in all the principal towns of Lancashire followed, and a considerable number of adherents were gained to the new cause. In Sept., 1833, according to the commonly received story (see Burne's *Teetotaler's Companion*, p. 333), the notable word *teetotal* was first used. A certain Richard Turner, or, as he was more generally called, "Dickie Turner," a plasterer's laborer or *lime-larry*, who was much given to holding forth in the Lancashire dialect at the meetings of the new sect, happened in the course of a philippic against temperance to say: "I'll hev nowt to do wi' this moderation—*botheration*—pledge; I'll be rect down tee-tee-total for ever and ever." "Well done, Dickie!" said Mr. Livesey: "that shall be the name of our new pledge." This origin of the word, which appears to make it but a stuttering pronunciation of *total*, has, however, been disputed; and it is affirmed that the term is simply a Lancashire phrase for final, thorough, or complete; thus, when a man is discharged merely for want of work, he is said to be *sacked*, but when discharged from inability to work, *teetotally sacked*. Whatever may have been the origin of the term, the new sect was resolved to be "thorough." In April, 1834, a *Youths' Temperance Society*, on strictly teetotal principles, was formed at Preston, and before a year had passed, it reckoned nearly 1000 members. By dint of zeal, respectable teetotal societies were also established at Manchester (Aug., 1834), Lancaster (Nov., 1834), Colne (Dec., 1834), Isle of Man (Dec., 1835), and numerous other places. Meanwhile (Sept., 1835), a conference of Lancashire and Yorkshire delegates was held at Manchester, and a new general society formed under the title of *The British Association for the Promotion of Temperance on the Principle of Total Abstinence from all Intoxicating Liquors*. This title clearly indicated the ambitious views of the new sect. It wished, and it hoped ere long, to speak in the name of the whole temperance party: and as early as 1836, one of the Yorkshire district societies, that of Wilsden, ventured to memorialize *The British and Foreign Temperance Society* of London on the subject of the total abstinence pledge. The answer that it received showed that a disruption was not far off. In Scotland and Ireland, the progress of teetotalism, as distinct from temperance, was not at first very marked; but its votaries were resolute, and held vehement discussions, public and private, with the advocates of the rival system, in which they were generally considered victorious by the crowds before whom they disputed. During 1834-35, teetotalism was struggling hard for recognition in London—the influential leaders of the old temperance society being dead against it. At length, however, owing to the persevering efforts of Mr. Livesey of Preston and other enthusiasts, the teetotalers got a footing, and, in Sept., 1835, established *The British Teetotal Temperance Society*, which, in Aug., 1836, was merged into *The New British and Foreign Society for the Suppression of Intemperance*. Teetotalism now in turn began to get the upper hand, and in the course of the next two or three years, the "moderate" party almost disappeared; the majority of its members doubtless passing over to the ranks of the total abstainers. But these new fell out among themselves. Up to 1839, *The New British and Foreign Society* had two pledges, the long and the short; the former including the "neither give nor offer" clause; and the latter omitting it. The more rigorous teetotalers made strenuous efforts to get the "short" pledge abolished, which were as strenuously opposed, and in a very brief period the whole teetotal world was up in wild commotion on the subject. Various meetings of "delegates" from the different societies in England, Scotland, and Ireland were held in London in May, 1839, under the presidency of earl Stanhope, and scenes of the utmost disorder ensued. The result was a temporary disruption, and the formation of two socie-

ties. Still the cause prospered in spite of fierce distractions. Strong provincial associations were formed in Yorkshire, Leicestershire, Lancashire, Norfolk, and Cornwall and Wales, almost always on the "long pledge" principle. In Scotland, the "long pledge" took deep root; indeed, after 1837-38, the "short pledge" was scarcely ever thought of. But it was in Ireland that the most brilliant successes attended the movement. In 1838, father Mathew (q.v.) commenced his extraordinary career, and in less than two years, 1,800,000 men and women were enrolled in *Ireland's Great National Total Abstinence Society*.

The subsequent history of the movement must be briefly sketched. In Nov., 1842, the disruption, above mentioned, of *The British and Foreign Temperance Society* was healed, and the two societies which that disruption had called into existence were amalgamated in *The National Temperance Society*. The work of proselytizing then went on vigorously. Innumerable tracts were circulated, and all Britain echoed with the noise of infinite speech. Excursions, processions, Exeter hall demonstrations, incessant tea-parties, etc., were got up with enthusiasm, which speaks volumes for the energy and sincerity of the teetotal agents. But in a less showy though more noble way, the missionaries of the new faith pursued their benevolent work in the lanes and alleys of large cities, the haunts of profligacy and dissipation, where they sought out the homes of drunkards, and tried (not without success) to rescue them from the power of the horrible vice that was dragging them to destruction. Action of this sort—whatever one may think of the movement as a whole—is to be spoken of only with reference. In Aug., 1846, *The World's Temperance Convention* met in London, on which occasion 302 delegates were present, representing different societies in the United Kingdom and the United States. Since then, the temperance cause has steadily, if not rapidly, progressed. It has recently been estimated that there are not fewer than 4,000,000 total abstainers (inclusive of juveniles) in Great Britain and Ireland, and a much greater number in the United States of America. Of late years, total abstainers have devoted themselves mainly or largely to advocating the necessity or propriety of imperial legislation on the subject of intoxicating liquor.

The most recent development of the temperance movement is that known as *Good Templarism*. It originated in New York in 1851, and rapidly spread through the United States. In 1868, the order established itself in England, in 1869 in Scotland, and in 1870 in Ireland. Its progress has been singularly rapid. In England alone, exclusive of Scotland, Ireland, and Wales, there were in 1875 no fewer than 3,570 "lodges," having 168,425 members, estimated in 1879 to have increased to more than 200,000 persons. These of course do not represent absolutely new adherents to the temperance cause. They are in many cases members drawn from the older temperance societies, though it is also an undoubted fact that the order has been very successful in making fresh converts to the cause of total abstinence. The name is derived from the famous *Knights Templars*, and originated in a fanciful analogy between the functions of the ancient order of military monks, and the modern disciples of temperance. As the former were enrolled to defend the holy sepulcher and the interests of religion, so the latter are banded together to protect Christianity against a worse foe than the Saracens, viz., "the drinking institutions of the land." It is professedly a *religious* movement, and its ritual is evangelical. Its platform is absolute prohibition of the manufacture, importation, sale, or use of all intoxicating liquors as beverages: but it owes its great popularity to certain peculiarities in its constitution, its picturesque or showy ceremonial, and its aim to combine social and festive amusements with missionary zeal.—See *Good Templarism*, by the rev. George Gladstone (Glasgow, 1872); as also the several regularly appearing magazines of the order, the *Good Templar*, the *Good Templars' Watchword*, etc.

Pleas and Counter-pleas.—The question of abstinence from intoxicating liquors is capable of being argued on three distinct grounds, *scriptural*, *physiological*, and *social*. We propose to furnish a brief synopsis of the leading arguments *pro* and *con* under each of these aspects. First, then, the *scriptural argument*.

The scriptural argument in favor of abstinence from intoxicating liquor may be briefly stated. The only "strong drink" mentioned in the Bible is wine. It is both praised and blamed. The question raised by teetotalers is: Are the sacred writers referring in both cases to the same kind of wine? This they deny, and endeavor to make good their denial by an appeal to the original Hebrew. On examination it is found that ten or twelve different designations for wine are used, but the two by far the most frequent are *yayin* and *tirosh*. The first of these is the generic term for wine, and therefore (say the advocates of total abstinence), as it *must* embrace fermented liquor, it is the word used when wine is denounced. Thus, it is *yayin* that is a "mocker" (Prov. xx. 1), that is not to be looked upon (Prov. xxiii. 31, 32), etc. On the other hand, when wine is praised, *tirosh* is the word used, and *tirosh* (it is asserted) means the wine in clusters, that is, the actual grape itself, or the unfermented juice thereof, then, as now, liberally drunk as a beverage by the inhabitants of Syria and elsewhere. The application of this view to the New Testament is obvious. If there was a wine that might be used, as well as a wine that was condemned—which, ask the teetotalers, would Christ and his apostles be most likely to sanction? The wine that "maketh red the eyes," that "biteth like a serpent," and stingeth like an adder," that "deceiveth," that "maketh drunken" and "mad;" or the wine that "maketh glad the heart," that is "good," a "blessing," etc.;

—in a word, *yayin* in any of its dangerous forms (*sôbe*, from the root to “soak;” *chemer*, the “foaming or bubbling;” and *mêsec*, *mêzeg*, *namsac*, the mixed wines), or the innocent *tîrôsh*, that cheers, but not inebriates? It is conceived that there can be but one answer to this question, and that every candid and reverent Christian must be forced to the conclusion, that the wine which Jesus made at the marriage-feast at Cana of Galilee, and used in his last supper with his disciples, and which Paul advised Timothy to drink for his stomach's sake, was the unfermented, innocuous, and popular *tîrôsh*.

To this it is replied that the distinction made between *yayin* and *tîrôsh* does not exist. Both parties are agreed that the former term is the generic one (corresponding with the Greek *oinos*, the Latin *vinum*, and the English *wine*, with all of which it is believed to be etymologically connected); but it is denied by the scriptural opponents of total abstinence that *yayin* means fermented, and *tîrôsh*, unfermented wines, exclusively. Not to trench upon the chemistry of the question, which, it is affirmed, wholly disproves the possibility of the “juice of the grape,” being kept for any length of time without undergoing a process of fermentation, and thereby acquiring to a certain degree intoxicating properties, it is alleged that the etymology of *tîrôsh* does not favor the teetotal view. According to Gesenius, it is derived from the root *yârash*, “to get possession of;” that is, of the brain. Dr. Lees, indeed, quotes Bythner as suggesting that it may have been so named because the vine was a “possession” in the eyes of the Hebrews; but this is extremely improbable, and in the absence of other explanations, that of Gesenius is certainly to be preferred. Again *tîrôsh* is not exclusively used to denote the “fruit” (strictly so called) of the vine; the dreaded *yayin* performs the same harmless function—e.g., in Jer. xl. 10, 12, where it is connected with a verb significant of “gathering,” and in Ps. civ. 14, 15, with another expressive of growth. It is even denied that *tîrôsh* is ordinarily to be so understood, for although, being mostly found in connection with “corn,” the verb applied to the consumption of that article of food is by *zayma* made to apply to the “wine” also, yet in the only passage where the act of consuming *tîrôsh* alone is mentioned (Is. lxii. 8, 9), the verb is *shâthâh*, which invariably signifies the act of drinking. Lastly, it cannot be shown that *tîrôsh*, when it does mean wine, means innocuous wine. No doubt, *yayin* is the one generally employed when wine is denounced, and *tîrôsh* when it is praised, but this is not uniformly the case, for in Hos. iv. 11, “whoredom and wine (*yayin*) and new wine (*tîrôsh*) take away the heart,” *tîrôsh* actually forms (as has been remarked) “the climax” of intoxicating influences. The conclusion, therefore, to be drawn from a consideration of Scripture is, that the distinction insisted on by total abstinents between the two terms—viz., that the one (*yayin*) means fermented, and the other (*tîrôsh*) unfermented wines, is one that cannot be maintained. Both must be held as referring to fermented intoxicating wine; and the praise of *tîrôsh* is simply to be considered a recommendation of the moderate use of ordinary wine, as the condemnation of *yayin* is to be regarded as a solemn prohibition of excess in the same.

The physiological argument in favor of total abstinence necessarily takes various shapes; for it is concerned with physiological questions which are yet, to a great extent, matter of opinion—of speculation and conjecture, not of science. A question arises upon three distinct points: 1st, the effects of alcoholic liquors in quantities sufficient to produce intoxication; 2d, their effects when habitually used in moderate quantities; 3d, the effect of abstaining from them altogether.

Upon the first point, teetotalers usually maintain that insanity, idiocy, almost every form of organic disease, many chronic, not a few acute disorders, are frequent results of habitual intoxication; that the children of drunkards are often idiotic, and have transmitted to them various diseases, which are produced by excessive drinking—which, therefore, tends to the deterioration of the race; that drunkards are always the first victims of epidemics; and that it can be shown from tables of mortality that drinking has a marked effect in shortening life. It is not disputed that many of these effects can be connected with the habitual use of liquors in excess; but as to some of the most striking of them, it is denied that they are physiological effects of such excess—being not direct results of hard drinking, but due to the bad conditions under which poor people who drink hard usually live. The question between teetotalers and those who differ from them, at this point, however, is only a matter of degree. The latter admit that alcohol, in narcotic or intoxicating quantities, produces only injurious results. In such quantities it has a deteriorating, a devitalizing influence upon the brain and nervous tissue, and habitual excess in its use is attended by a progressive impairment of nervous structure, indicated at length by such results as epilepsy or delirium. See INTOXICATION. But the results of excess differ greatly, it is said, in the case of different persons, so that, not unfrequently, many years of hard drinking do not affect the system of the drinker in a marked degree.

It is upon the second point—the habitual use of alcoholic drinks in moderation—that the opinion of teetotalers seriously conflicts with that of many physiologists. The teetotal argument—leaving out minor points, such as an alleged effect of alcohol in impairing the digestion—may be stated thus: 1. Alcohol can never have been intended by nature for the food of men. It is never produced spontaneously in nature. The vegetable world yields in abundance the principles which form the flesh, and those which keep up the heat of the body, but the healthy plant never produces alcohol. In the body too, in health, food is never converted into alcohol. And the body does not

merely not produce alcohol; it treats it as a foreign element, and gets rid of it as fast as possible. 2. Alcohol in the body, by taking up the oxygen supplied through the lungs, checks the burning of tissue, upon which life and the production of energy, muscular or mental, depend; and similarly it impedes the efforts of the body to get rid of the waste matters which are the products of the burning. It thus lowers vitality, vitiates the blood, and prevents the production of healthy fiber. Toddy or beer taken at bed-time, instead of being favorable to health, has just the same effect, according to Dr. Carpenter, with sleeping in a four-post bed with the curtains carefully tucked under the bed-clothes. In either case, that is, there is a diminution of the supply of oxygen required for vital processes, especially for burning the waste of the body. 3. The stimulation produced by alcohol is succeeded by a recoil or reaction; and to produce a certain effect of stimulation, the quantity taken must constantly be increased. From this cause—to say nothing of social influences connected with drinking calculated to produce the same result—moderate drinking tends to pass into excessive drinking, about the evil consequences of which there is no dispute.

The physiological opinion opposed to those arguments is, that while alcohol, like other similar substances, has in large quantities a narcotic, a devitalizing effect, it has in small quantities a stimulating effect, between which and narcotism there is a difference, not of degree, but of kind. The stimulating effect is precisely the same with that of highly-nutritious and easily digested food; as regards the vital functions, it differs from the effect of ordinary food only in rapidity of production. It does not substitute an abnormal for the normal action of the bodily organs; it restores their natural functions; and it is capable of rectifying either deficient or redundant functional action. The only positive difference of effect between ordinary food and alcoholic stimulation is, that the latter does not, to any great extent, add to the bulk of the body. There is no recoil or reaction after it, except that, as in the case of ordinary food, the effect is exhausted after a time. There is nothing to support the belief in a reaction, except the depression involved in the gradual recovery from the narcotic effect of a large quantity of alcohol; but between the narcotic effect of a large, and the stimulating effect of a small, quantity, there is, as already said, a difference of kind—their connection is merely accidental. And the experience of mankind—the fact that moderate drinking does not usually pass into excessive drinking—sufficiently shows that it is not found necessary to increase the quantity used for stimulation. Since stimulation restores the natural functions, it, of course, is capable of removing the consequences of functions being perverted. Thus, it is maintained that, among other things, it gives relief from pain and muscular spasms, reduces the circulation when too rapid, produces healthy sleep, and removes general debility, as well as the fatigue of special organs. Whether it, to an important extent, affects the waste of tissue, or keeps waste matters in the blood, is at present undetermined; however this may be, there is no justification for holding that life is to be measured by the aggregation of tissue, or the rapidity of bodily changes. The notion that alcohol checks the burning of tissue by taking up the oxygen received by the lungs, originated when it was believed, upon the authority of Liebig (it was so believed until a few years ago, but the contrary is generally held now), that alcohol was altogether decomposed in the body. If these views are correct, it follows that alcohol, taken cautiously and in small quantities—the quantities varying with the circumstances and with the constitution of the individual—may be used not only with safety but with advantage.

Under the third head teetotalers, of course, maintain that total abstinence is highly favorable to health. They adduce their personal experience; the mortality statistics of one or two regiments and of ships' crews mainly, or entirely, made up of abstainers; the evidence of arctic voyagers on the one hand, and of travelers in tropical regions on the other, to prove that in every climate health can be maintained, and is most likely to be maintained, when no use is made of alcoholic drinks. On the other side, the fact that men of all races use alcoholic beverages is held to show that men, living as men must usually do, find those beverages useful, if not necessary. It is not disputed that many persons live in health without them—that persons having an abundance of wholesome food, not over-worked, living in well-constructed houses, and in wholesome air, can usually dispense with them. But when some, or all, of those conditions are wanting—which in towns, at any rate, happens in all but exceptional cases—it is alleged that a nearer approach to health is made when a moderate use is made of alcohol.

The social arguments in favor of total abstinence, though very weighty and earnestly insisted upon, can be indicated in a few sentences. It is affirmed that the use of alcoholic drinks is at the root of all the misfortunes of the poorest and most numerous class; that it is the chief cause of pauperism, the chief cause of crime, a frequent occasion of immorality; that it lowers the health and shortens the life of the great mass of artisans and laborers, makes their homes wretched, and exposes them and their families to the evils and temptations of chronic destitution. Then, such are the seductive influences of drink and good-fellowship, that moderate drinkers are in danger of becoming drunkards; thus the use of liquors effects the ruin of a considerable percentage of the middle and upper classes. Total abstinence is demanded as a measure of personal precaution, because no one who drinks at all is safe against falling into drunkenness; as a patriotic duty, incumbent upon those who desire the improvement of the poorer classes; as a duty

of example which every man owes to his neighbor, and which, involving self-denial, must have a favorable reflex influence upon character. On the other side, it is not denied that drinking is closely connected with, or that it exasperates, the misery undergone by the poor; but it is denied that it is the cause of the misery. It is maintained that drinking must be regarded as an effect of the bad conditions inherited by the poor, and under which they live. Persons born in close alleys, and brought up in foul air, living always from hand to mouth, often upon insufficient or unwholesome food, feel (it is said) a need of stimulants to support vitality. It is affirmed that the fluctuations of crime (properly so called) do not depend upon the amount of drinking, but—so far as they can be traced to one circumstance—upon variations in wages; that it is destitution, not drunkenness, that contributes most largely to the production of crime. The drunkenness, the crime, the pauperism, it is maintained, cannot be permanently reduced except through a material and moral improvement being effected among the poor. Then it is denied that moderate drinkers, in general, are in any danger of becoming drunkards; it is persons wanting in prudence, and of intemperate constitution, who are exposed to that danger.

Of late years total abstinents—in unison with others who, though not themselves abstainers, are anxious to promote public sobriety—have exerted themselves to obtain, in one shape or another, a legislative prohibition of the trade in drink. This movement was set on foot in Great Britain in 1853, by an organization called "the United Kingdom alliance," on account of the success which had crowned the exertions of teetotallers in Maine and many other of the United States. In Maine the liquor traffic was suppressed in 1846; the law was made more stringent by a provision for confiscating all alcoholic drinks in 1851; and though in 1856 the existing laws were repealed, and it became lawful to distill spirits, to sell spirits, and to have spirits in possession, drinking-houses continued to be prohibited. The "alliance" soon found that there was no possibility of carrying a Maine liquor-law through the British parliament; and they have accordingly confined themselves to asking for a permissive bill, enabling the ratepayers of a parish, if a majority of two-thirds of them should think fit, to suppress all public-houses within the parish. Hitherto they have been unsuccessful. They support the bill upon the merits by a variety of arguments. Alcohol, they say, being a poison, its sale ought to be subject to the same restrictions as that of other poisons. The legislature has admitted the exceptional and dangerous nature of the liquor trade, by putting it under strict regulation; in consistency, it should suppress it as a trade altogether. They allege that the amount of drinking in a place always varies directly with the number of public-houses; and then that the amount of crime and of pauperism varies directly with the amount of drinking. In 1857 Dr. Lees calculated the expense of the use of liquors to this country at 120 millions a year—the cost of the liquor being put at 60 millions, and the remainder of the amount made up by allowing for the crime and pauperism caused by drinking, the loss of time in drinking, and, through disease induced by drinking, the waste of life consequent upon it and many minor items. This money, it is said, if not spent upon drink, would have a marvelous effect in improving the condition of the poor. On the other side, it is maintained, *in limine*, that the subject-matter of this bill is so very important, and so full of difficulty, that parliament should not delegate its functions in respect of it to the ratepayers; also, that to do so would be to plant, in every parish in the country, the seeds of perpetual strife. Upon the merits it is said that a prohibitory law could not be carried out—at any rate, in large towns where the worst evils connected with drinking are found; and that systematic attempts at evasion would be made, which would demoralize the people, and put them in chronic antagonism to the law. Besides the arguments already stated upon this side, it is urged that—excepting the case of poisonous substances—it is no part of the duty of a governing body to say to its people: You shall not spend your money upon this or that; that it is unreasonable, in a fiscal point of view, to speak of the national resources being wasted upon liquors any more than upon tea or beef, or other substances that perish with the using; and that the power of procuring articles which are desired is what men work for—the great motive of industry. It is also maintained that compulsory abstinence from drink would not produce the same results as voluntary abstinence; that men would seek indemnifications, resorting, it might be, to other and more injurious narcotics than alcohol, and to vices which might be even more injurious than drinking. It is said that abstinence, to be valuable, must be a sign of a moral improvement; and that it is safest we should leave the poor to face the temptations of their situation, trying to fortify them against these temptations by education, by giving them just, moral, and religious views; at the same time holding before them the spectacle of temperance and its results in the case of the more comfortable classes.

The following are the leading organizations in Great Britain that, with various modifications of creed, carry on the temperance agitation. They can claim as directors and advocates men of acknowledged position and ability; and the aggregate sum of money spent annually is very great. The National temperance league, London (organ, the *Weekly Record*); the United Kingdom alliance, Manchester, with numerous branches (organ, the *Alliance News*); the church of England and Ireland temperance society, London (organ, the *Church of England Temperance Magazine*); the Scottish temperance league, Glasgow (organ, the *League Journal*); the National band of hope union, London

(organ. *Band of Hope Review*). Besides these, the Roman Catholic and Methodist branches of the temperance society form distinct organizations, while the order of *Good Templars* has its organs in the United States, and in England, Scotland, and Ireland.

TEMPERATURE OF THE BODY IN HEALTH AND DISEASE. It is universally admitted, as a result of the observations of numerous physiologists, among whom our own countryman, Dr. John Davy, stands pre-eminent, that although the range of temperature varies in different parts of the human body, the normal temperature at completely sheltered parts of the surface amounts to $98^{\circ}.4$, or a few tenths more or less in temperate climates; and that if there is a persistent elevation above $99^{\circ}.5$, or a depression below $97^{\circ}.3$, some form of disease is certainly indicated. (In warm-blooded animals, generally, the temperature is one degree lower at completely sheltered parts of the surface than in the back of the mouth, or other accessible internal parts.)

Some of the circumstances which cause a deviation from the normal temperature are mentioned in the article on ANIMAL HEAT. It may be further noticed, that exposure to cold without exercise, and sustained mental exertion, reduce the temperature, and that the amount of heat is at first reduced after a full meal, although, as stated in the above-named article, it subsequently rises. Moreover, in the tropics, the average temperature is nearly 1° higher than in temperate regions.

When the temperature rises in cases of disease, the following relation to its augmentation and that of the pulse has been established: *an increase of temperature of 1° above 98° corresponds with an increase of 10 beats of the pulse in the minute.* Thus, if the pulse is 60 at 98° , it is 70 at 99° , 80 at 100° , and so on. It is now established beyond all doubt, by the observations of Wunderlich, Virchow, and many other foreign physicians, and by Parkes, Jenner, Aitken, and Ringer in this country, that the preternatural heat which in certain cases can be detected by the thermometer, and may exist to the extent of 4° , 6° , or even 8° above the healthy average, and which varies in amount in different diseases, in different persons, and at different times of the same day, is the essential symptom of fever. Dr. Davy, in his *Physiological and Anatomical Researches*, vol. i. p. 206, describes the case of a lunatic soldier, in whom the accidental discovery that his temperature was 6° above the normal standard, led to the detection of tubercular disease of the lungs and intestines. Wunderlich, whose experience embraces at least half-a-million exact thermometric observations, bears unqualified testimony to the value of this mode of investigation in the early detection of disease, and as often furnishing an important guide to treatment. Some of these instances are quoted by Dr. Aitken in his *Science and Practice of Medicine*, 3d ed. vol. i. pp. 44-46.

We give in a condensed form a few of the more important of these observations. In *ague*, the temperature of the body begins to rise several hours before the beginning of the paroxysm, and after the disease *seems* to have disappeared, a periodic increase of the temperature may still be detected, and as long as this continues, the patient is not really cured. In *typhoid fever*, the rise of temperature, or its abnormal fall, will indicate what is about to happen three or even four days before any change in the pulse or other sign of mischief has been observed. A sudden fall of temperature has thus denoted intestinal hemorrhage several days before it appeared in the stools. A fall as low as 93° was noticed by Parkes in a case of this kind. When a person, who yesterday was healthy, exhibits this morning a temperature above 104° , it is almost certain that an attack of ephemeral fever or *ague* is coming on, and should the temperature rise up to or beyond $106^{\circ}.3$, the case will certainly turn out one of *ague* or of some other form of malarious fever. If, during the first day of illness, the temperature rises to 106° , it is certain that the patient does not suffer from typhus or typhoid fever; and if the temperature of a patient, who exhibits the general signs of pneumonia, never reaches $101^{\circ}.7$, it is certain that there is no soft infiltration in the lungs. "In typhoid fever, a temperature which does not exceed on any evening $103^{\circ}.5$, indicates a probable mild course of fever. A temperature of 105° in the evening, or 104° in the morning, shows that the attack is a severe one, and forebodes danger during the third week. On the other hand, a temperature of $101^{\circ}.7$, and below, in the morning, indicates a very mild attack, or the commencement of convalescence. In pneumonia, a temperature of 104° and upward indicates a severe attack. In acute rheumatism a temperature of 104° is always an alarming symptom. In a case of jaundice otherwise mild, an increase of temperature indicates a pernicious turn. In tuberculosis, an increase of temperature shows that the disease is advancing, and that untoward complications are setting in. In short, a fever temperature of 104° to 105° in any disease indicates that its progress is not checked, and that complications may still occur."—*Op. cit.*, p. 21. We may further observe that, from the observations of Dr. Sidney Ringer, a persistent elevation of temperature exists as an invariable precursor of the growth of tubercle in any organ. As a general rule, when the temperature rises continuously to $106^{\circ}.2$, the prognosis is unfavorable; and when it rises to 110° , a fatal issue is almost certain. The diseases in which the highest temperatures have been observed are scarlatina, in which it has been noted at 112° , and tetanus, in which, at the period of death, it was $112^{\circ}.5$, and an hour afterward was $113^{\circ}.8$. In Dr. Aitken's work, the reader will find a series of diagrams illustrating the range of temperature in *ague*, *crysipelas*, *measles*, *pneumonia*, *simple continued fever*, *scarlatina*,

small-pox, typhoid and typhus fevers, etc., together with a full description of the instruments to be used, the method of using them, and practical rules for recording observations.

TEMPERED, or TOUGHENED, GLASS, glass in a peculiar molecular condition, produced by placing it while hot in a tight box containing oil. The box is tight to prevent ignition of the oil. The surface to variable depths, depending upon the conditions of the experiment, becomes very hard, and apparently tough, for articles of glass prepared by this method may be thrown with considerable violence upon the ground without breaking. When, however, they do break they are shattered into minute fragments, after the manner of prince Rupert's drops (q. v.), indicating that the molecules of glass are held together in a condition of strain, and this is shown to be the case by an examination of the optical properties of the glass. Continued jarring will produce disintegration, and the material will not bear to be ground. It is the invention of M. de la Bastie of France.

TEMPERING METALS. A peculiar effect is produced upon some metals by heating them to redness, and then suddenly cooling them. By this means, extreme hardness is obtained, especially in steel, which is so susceptible to this process, called tempering, that almost any degree of hardness and brittleness can be obtained. If, for instance, we make a piece of steel red hot, and then plunge it into cold water, it becomes hard and brittle when cold, and is actually, though slightly, increased in bulk. But if we reheat the metal, and allow it to cool slowly, it again becomes soft and malleable as before. Moreover, if we again reheat it, but not to redness, and cool it suddenly, it is still further softened. If, before reheating, the surface has been polished, a beautiful shade of color is produced by the heat, which is varied according to the temperature employed; and so exactly is this the case, that the experienced manipulator is entirely guided by the color produced, instead of by nice regulations of the heat applied. For ordinary operations, the metal is cooled by plunging it in cold water; but oil, mercury, and saline solutions are used for special purposes. An exact series of experiments has proved that the following colors are produced at the temperatures given: very pale yellowish, by 430° Fahr.; pale straw, 450°; yellow, 470°; brown, 490°; mottled brown, 510°; purple, 530°; bright blue, 550°; blue, 560°; dark blue, 600°.

TEMPLARS, KNIGHTS, a celebrated religious and military order, founded at Jerusalem in the beginning of the 12th c., by Hugues de Paganes, Geoffroy de St. Omer, and seven other French knights, for the protection of the Holy Sepulcher, and of pilgrims resorting thither. Baldwin II., king of Jerusalem, bestowed on this order their first place of residence; and an additional building was acquired from the abbot and canons of the church and convent of the temple, whence the order obtained the name of the "poor soldiers of the temple of Solomon," afterward abbreviated into templars. The knights were bound by their rule to hear the holy office every day, or if prevented by their military duties, to say a certain number of paternosters instead; they were to abstain from flesh four days in the week, and from eggs and milk on Fridays. They might have three horses and an esquire each, but were forbidden to hunt or fowl. In the earlier period of their history, the templars made a great show of poverty, contrasting much with their later condition. After the conquest of Jerusalem by the Saracens, they spread over Europe; their valor became everywhere celebrated; immense donations in money and land were showered on them; and members of the most distinguished families thought themselves honored by enrolment in the order. In every country where they existed, they had their governor, called the master of the temple or of the militia of the temple. The templars had settlements in England from an early period. The first was in London, on the site of Southampton buildings, Holborn; but from 1185 their principal seat was in Fleet street, still known as the temple. The round church which bears their name was dedicated by Heraclius, patriarch of the church of the resurrection in Jerusalem, in 1185, and the chancel was consecrated in 1240.

The templars were at first all laymen and of noble birth. Pope Alexander III., however, in 1162, authorized the admission of spiritual persons not bound by previous vows, as chaplains to the order, who were not required to adopt the military vows. A third class was afterward introduced, consisting of laymen not of noble birth, who entered as serving brothers, some of them being attendants on the knights, and others exercising trades in the houses or lands of the order. Eventually, many persons became affiliated members without taking the vows, for the sake of the protection afforded them. As the power and prosperity of the templars increased, so did their luxury, arrogance, and other vices, which gave the French kings a pretext for endeavoring to suppress them, and lay hold of their possessions. Accusations, many of which were absurd and incredible, were brought against them by two members of their own body. Their principal enemy was Philippe IV. of France, who induced pope Clement V. to accede to a scheme by which the whole members of the order were seized and imprisoned, their lands confiscated, and many of them tried, convicted, and executed for capital crimes. The English templars were arrested by command of Edward II.; and a council held in London in 1209 having convicted them of various crimes, most of which were probably imaginary, the king seized their possessions. In 1312 the whole order throughout Europe was suppressed by the council of Vienne, and its property bestowed on the

knights of St. John, to which latter order their English possessions were formally transferred by a statute of Edward II. in 1323.

The habit of the templars was white, with a red cross of eight points of the Maltese form worn on the left shoulder. Their war-cry was "beau seant;" and their banner, which bore the same name, was parted per fess sable and argent. They also displayed above their lances a white banner charged with the cross of the order. Their badges were the *Agnus Dei*, and a representation of two knights mounted on one horse—indicative of the original poverty of the order:—See Addison's *History of the Knights Templars, the Temple Church, and the Temple* (Lond. 1842); A. O. Haye's *Persécution of the Knights Templars* (Edin. 1865).

TEMPLE, a mold in wood or metal, showing the outline or profile of moldings, and from which the workmen execute the molding.

TEMPLE (so called because the knights templars had one of their branches in that part of London), in its connection with the law of England, is a part of the city of London occupied exclusively by barristers or attorneys, with few exceptions. It is the joint-property of the two Inns of Court (q.v.), called the societies of the inner temple and middle temple, each of which has a right of calling persons to the degree of barrister—a privilege shared by the two other Inns of Court, Gray's Inn (q.v.) and Lincoln's Inn (q.v.). The temple consists of buildings occupied by barristers, who rent the same from the above two societies, who are the private proprietors, and issue their own regulations as to the management of the property.

TEMPLE, DANIEL, 1790–1851; b. Mass.; graduated Dartmouth college, 1817, and Andover seminary, 1820; sailed as a missionary of the American board to the east, 1822, with a printing-press; stationed at Malta, 1822–32, and had charge of the press; resided at Smyrna, 1832–44; returned to America, 1844. He published many books in modern Greek, Italian, and Armenian, wrote many scriptural histories, and edited and contributed to a monthly magazine in modern Greek. His life and letters were published after his death by his son, the rev. Daniel H. Temple.

TEMPLE, FREDERICK, D.D., b. England, 1821; graduated with the highest honors at Balliol college, Oxford, 1842; was fellow and tutor in mathematics; ordained in the church of England, 1846; principal of the training college, Kneller hall, 1848–55; an inspector of schools, 1855–58; master of Rugby school, 1858–69; appointed bishop of Exeter, 1869, his confirmation as such being ineffectually opposed because of his share in writing, 1860, the well known *Essays and Reviews*. He is one of the queen's chaplains, and has published three volumes of sermons preached in Rugby chapel.

TEMPLE, RICHARD GRENVILLE, Earl, 1711–79, b. England; returned to parliament from Buckingham, 1734; and in 1752 succeeded to the earldom. He was a political associate of William Pitt, and held the positions of lord of the admiralty, 1756–57, and lord privy seal, 1757–61. The *Grenville Papers* (1852–53), edited by W. J. Smith, consist of the correspondence between Pitt and George and Richard Temple. They throw much light on the political and court life of the period.

TEMPLE, Sir WILLIAM, an eminent diplomatist and popular writer, was the eldest son of sir John Temple, master of the rolls in Ireland. He was born in London in 1628, studied for two years at Emmanuel college, Cambridge (where he had the celebrated Dr. Ralph Cudworth for tutor), and at the age of 19 went abroad on his travels. He acquired the French and Spanish languages, and also cultivated his taste for English composition. He entered on public life in 1661, as member for the co. of Carlow, in the Irish parliament. In 1665 he was selected to proceed to Westphalia on a secret mission to the bishop of Münster; and on his return he was created a baronet, and appointed resident at the court of Brussels. He was, as sir James Mackintosh has remarked, the model of a negotiator, "uniting politeness and address to honesty;" while, as a domestic politician, "in an age of extremes, he was attached to liberty, and yet averse from endangering the public peace." In fact the chief aim and desire of this accomplished statesman was to enjoy lettered ease and leisure, apart from all exciting public care and responsibility. His most important diplomatic success was the famous treaty of 1668, known as the triple alliance, by which England, Holland, and Sweden bound themselves to unite in curbing the ambition of France. This negotiation was accomplished in five days, in conjunction with the great Dutch statesman, De Witt. At the congress of Aix-la-Chapelle, and at the subsequent treaty of Nimeguen, Temple was also a negotiator. He was long ambassador at the Hague, and assisted in bringing about the marriage of the prince of Orange with the princess Mary. Charles II. in vain endeavored to prevail upon him to accept the appointment of secretary of state; but though shunning such arduous duty, he attempted to reform the government by establishing, with consent of the king, a privy council of 30 persons, by whose deliberations his majesty promised to be guided in all public affairs. As might have been foreseen, so numerous a council, under such a sovereign as Charles, and in times of such fierce rivalry and faction, proved an utter failure. Temple then finally abandoned politics, and retired to the country. When the revolution placed William III. on the throne, Temple was again solicited to become secretary of state; but he again refused. The remaining 10 years of his life were mostly spent at his favorite seat of Moor park,

in Surrey, where he carried out his schemes of planting and landscape gardening, and realized his early wish for studious retirement. During this period he had, as secretary and humble companion, the immortal Jonathan Swift, who regarded his stately self-complacent patron with more fear and distrust than affection, but who ultimately became his literary executor. Temple died at Moor park, in Jan., 1699. His collected works form four volumes (Lond. 1814).

As an author Temple is now known chiefly by his historical *Memoirs*, and his *Miscellanea*, the latter being a collection of essays on various subjects—as government, trade, ancient and modern learning, gardening, heroic virtue, and poetry. He has been considered one of the reformers of our style; “the first writer,” says Johnson, “who gave cadence to English prose.” His style has quite a modern air, and is smooth, copious, and agreeable. He is too pretentious as respects scholarship and learning, and has no weight as a political writer; but he expatiates very pleasantly on foreign travel and country life, on flowers and fruits, on parterres, terrace-walks, and fountains. His epicurean temperament is happily and characteristically displayed in the last words of his last essay. “When all is done,” he says, “human life is at the greatest and best but like a froward child, that must be played with and humored a little to keep it quiet till it falls asleep, and then the care is over.” This is taking the battle of life very easily, but it is not in such a manner that great men or true patriots are formed.

TEMPLEMORE, a market-t. of the co. of Tipperary, province of Munster, Ireland, is supposed to take its name from a commandery of the knights templars, and is situated on the right bank of the river Suir, 9 m. n. of Thurles. Although without manufactures of any note, Templemore has some considerable share of inland traffic. It is a station on the Great Southern and Western railway, 79 m. distant from Dublin. The public buildings, one of which is an extensive barrack, are substantial, but without any noteworthy, architectural character. The pop. in 1871 was 3,497, of whom 2,493 were Roman Catholics.

TEMPO (Ital. time), the degree of rapidity with which a piece of music is to be executed. The rhythmical proportions of notes, as indicated by their form, give them only a relative value, and have no reference to the absolute speed with which the composition should be played. Some compositions require, from their character, a quick lively movement; for others, a slower movement is more suitable; and different terms are used to indicate different gradations of movement. Of these the principal, beginning with the slowest, are: *Largo*, broad; *larghetto*, somewhat broad; *lento*, dragging; *grave*, heavy, solemn; *adagio*, slow; *andantino*, moving a little; *andante*, moving; *allegretto*, somewhat lively; *moderato*, moderately quick; *allegro*, lively; *vivace*, with vivacity; *presto*, rapidly; *prestissimo*, with great rapidity. These terms are not always used with the precision that might be wished, and sometimes apply more to the character than to the absolute speed of performance. They are often modified by other qualifying words, as *allegro con brio*, lively and with briskness; *allegro appassionato*, passionately excited. The *tempo* is indicated with more exactness by a reference to the beat of the metronome (q.v.). Thus, M.M. ♩ = 120, signifies that 120 beats of the metronome, each representing a crochet, are to fill up the space of a minute; M.M. ♪ = 60, that 60 quavers are to be performed in a minute.

While the general rule is, that the time of a movement is to be steady and unvarying, cases often occur where a certain part of a composition has to be taken quicker or slower than the rest; this is indicated by such terms as *più vivo*, more lively; or *ritenuto*, kept back; while a return to the original time is expressed by the words *a tempo*. The performer may be required to proceed from one degree of movement to another, not abruptly, but gradually; the time used to express this are: *ritasciando*, slackening; *ritardando*, retarding; *calando*, calming down; *stringendo*, pressing on; *accelerando*, gradually increasing speed; with some others.

TEMPO RUBATO (stolen time) is the name given to a mode of performance in which a restless character is imparted by protracting one note beyond its proper duration, and curtailing another, so that the aggregate duration of each measure remains unchanged.

TEMPORAL BONES. See **SKULL**, *ante*.

TEMPORAL POWER (OF THE POPE) is a phrase susceptible of two meanings, which are very distinct from each other, and the confusion of which has led to frequent and serious misunderstanding.

I. In one of these senses it means the sovereign power which the pope possessed as ruler of the so-called papal states (q.v.), and which, especially of late years, has been the subject of much controversy. The power which the pope exercised within his own states, although modified in its exercise by his spiritual character, was in substance the same as that of any arbitrary sovereign. The history of its origin and progress, and of the variation of the limits within which it has been acknowledged, is briefly detailed under the head **PAPAL STATES**. The question as to the necessity or utility of such a power vested in the hands of a spiritual ruler, and even of its lawfulness and its compatibility with his spiritual duties, has been very warmly debated; nor is this controversy of entirely recent origin. Many of the mediæval sectaries put forward the principle of the incompatibility of the spiritual with the temporal power in the same person, not only in relation to the pope, but also as to the baron-bishops or other ecclesiastical

seigneurs of that age. Such were the doctrines of the Vaudois, of Pierre de Bruis, and above all, of Arnold of Brescia. The last-named of these rendered himself specially obnoxious by the activity and even turbulence with which he propagated this view, and the sentence of death under which he suffered was the penalty of rebellion quite as much as of heresy. Through the centuries which followed, the anti-papal controversies turned so entirely upon doctrine, that there was little room for the discussion of this question, and it is a mistake to suppose, as has not unfrequently been done, that it entered in any way into the conflict of Gallican and Ultramontane principles. Even the great Gallican champion, Bossuet, not only admitted the lawfulness of the pope's temporal sovereignty, but contended that it was in some sense necessary to the free exercise of his spiritual power, and to the independence of his ecclesiastical government. It was not until the aggression of the French republic upon Rome, and the annexation of the papal provinces called the Legations to the Cisalpine republic, and afterward to the kingdom of Italy, by Bonaparte, that the controversy assumed any practical interest. During the later conflict between Pius VII. and Napoleon I., the design which the latter entertained of a still further annexation of papal territory was one of the main causes of dispute; and still more recently, after the re-annexation of nearly the same portions of the papal states to the kingdom of Italy, the question once more agitated the entire Catholic world. No formal and authoritative judgment of the Roman church was pronounced regarding it; but a strong and almost unanimous expression of opinion was tendered to the present pope, Pius IX., in the form of letters and addresses from bishops and others in every part of Catholic Christendom. The tenor of all these is nearly the same. They profess that the possession of temporal sovereignty is no essential part of the privileges of the successor of St. Peter; but they also regard the possession of a sovereignty independent of any particular sovereign, as the means providentially established for the protection of the spiritual independence of the pope, and of the free exercise of his functions as spiritual ruler of the church. The contrary opinion held by some distinguished members of the Roman church, although regarded with great disfavor, was not formally condemned by a doctrinal decision, nor was any action taken on it in the Vatican council. The recent annexation of the city of Rome itself to the kingdom of Italy elicited a still stronger expression. The event is noticed in the article papal states (q. v.).

II. By the second signification of the phrase "temporal power of the pope" is understood what would more properly be called the claim of the pope, in virtue of his office, to a power over the temporalities of other kings and states.

This power may be of two kinds, *directive* and *coercive*. In the first sense, it is a claim which no Catholic, consistently with his belief of the spiritual supremacy of the pontiff, can be supposed to deny, as it imports nothing more than that the pope, as supreme moral teacher, has power to instruct all members of his church, whether subjects or sovereigns, in the moral duties of their several states.

If the power be regarded as coercive, it is necessary to distinguish the nature of the coercion which may be employed. That coercion may either consist in the threat or infliction of *purely spiritual censures*; or it may involve temporal consequences, such as suspension or deprivation of office, forfeiture of the allegiance of subjects, and even liability to the punishment of death. Considered in the former sense, the claim must be regarded as a natural consequence of the spiritual headship of the church, which is acknowledged by all Catholics; nor can it be denied that the power to compel sovereigns, by purely spiritual censures, to the fulfillment of the moral duties which their state imposes, is a natural concomitant of the spiritual primacy.

But the papal claim to authority over the temporalities of kings has gone far beyond these limits. From the 10th c. downward, popes have claimed and have repeatedly exercised a power of coercing kings, and punishing them when refractory by suspension, by deprivation, and by the transfer of the allegiance of their subjects to another sovereign. This well-known claim has been a subject of controversy in the Roman Catholic church between the Gallican (q. v.) and Ultramontane (q. v.) schools; and in the Ultramontane school, two different theories have been devised for its explanation. The first and most extreme (which holds the power to be a direct one) supposes that this power was given directly by God to St. Peter and his successors, that the two powers are fore-shown by the "two swords" mentioned in Luke xxii. 38, and that the temporal power is a privilege of the primacy by divine law, equally with the spiritual sovereignty itself. According to the second, or *indirect* theory, the temporal power is not directly of divine institution, but is an indirect though necessary consequence of the spiritual supremacy; and is only given as a means of completing, and, in a corrupt and disorganized state rendering more efficacious, the work which the spiritual supremacy is directly instituted to accomplish. It was in this latter form that the theory of the temporal power was defended by the great champion of Ultramontanism, cardinal Bellarmine, and the celebrated declaration of the Gallican clergy (*Declaratio Cleri Gallicani*) in 1682 (see GALLICAN CHURCH) was directed against it.

A third view of the temporal power, and one which has found many modern defenders, was propounded by the celebrated Fenelon (q. v.). According to Fenelon's theory, which is generally described as the historical theory of the temporal power, the pope does not possess, whether by direct divine appointment, or in virtue of the necessities of his spiritual office, any temporal power whatsoever. But he possesses the

plenitude of that spiritual power which is required for the government of the church, and he is empowered to enforce it by spiritual penalties, and especially by excommunication or deprivation of membership of the church. Now, although excommunication and such other penalties, of their own nature, are purely spiritual, yet the religious sentiment of the medieval period, and the awe with which it regarded the authority of the church, invested these penalties with certain temporal effects. See EXCOMMUNICATION.

The penalty of forfeiture of certain civil rights was attached by the law of England, in the case of private persons, to the spiritual censure of excommunication (q. v.). The same penalty was applied by the laws of other countries to the sovereigns themselves; by the law of Spain in the sixth council of Toledo in 638; that of France, as confessed by Charles the Bald in 859; the law of England, under Edward the Confessor, and the so-called Saxon and Swabian codes of Germany. The last-named codes recognize in the pope, in certain specified cases, the right to excommunicate the emperor himself; and ordain that in case the emperor should remain for twelve months without being absolved from the excommunication, he shall be deposed. In the appeal of the Saxon nobles to the pope against Henry IV., this law is expressly referred to. The contemporary historians, Paul of Bernried, Lambert of Aschaffenburg, Nicholas Roselli, and others, describe it as the ground of the emperor's deposition; and even Henry himself, without denying the force of the law, sought his defense solely in a denial of the charge of heresy which was imputed to him. The same spirit of the age is exhibited in the form of oath taken at the coronation of the sovereign in many countries, especially (although not exclusively) in those whose kings—as Roger of Sicily, Peter III. of Aragon, Guiscard of Naples, Godfrey of Jerusalem, and John of England—had made their kingdoms feudatory to the see of Rome; by which the monarch swore to be the protector and defender of the sovereign pontiff and the holy Roman church in all their necessities and utilities, and to guard and maintain their possessions, honors, and rights.

From these and similar indications of the public feeling of the mediæval time, the advocates of this theory of the temporal power infer that orthodoxy and obedience to the pope, in all essential matters of faith and discipline, were by the consent, express or tacit, of sovereigns and of peoples accepted as a condition of the tenure of supreme civil authority—a condition similar in its character and objects to that which forms the basis of the limitation settlement of the succession to the English crown, to the heirs of the princess Sophia of Hanover, “being Protestant.” Hence they conclude that the function really exercised by the popes in relation to heterodox or scandalously immoral sovereigns, or oppressors of the church and church liberties, was in itself a spiritual one, and that the civil consequences which it entailed of deprivation or deposition arose, not from the church law, but from the expressed or understood international civil law of the age. This notion of the origin and nature of the pope's power over sovereigns and states may be regarded as the view now commonly received, and it may help to a better understanding of some points of the controversy regarding the celebrated Syllabus. It may be added, that this view is not confined to Catholic writers, but is held by Leibnitz, Pfeffel, Eichhorn, Voigt, Frederick Hurter (while still a Protestant), and others.

On the other hand, it is difficult, if not impossible, to reconcile this theory with the language used by the popes themselves in enforcing their claim to temporal authority, and with the arguments upon which they rest that claim. Nor can it be denied that whatever is said of the cases of the exercise of such a power which occurred in the 12th and 13th centuries, the power continued to be claimed and to be exercised down to and even after the reformation, when it would be idle to suppose that any such public understanding, if it had existed in the middle ages, had not been revoked, if not by all, at least by those nations which had revolted from the Roman church.

The history of most of the principal instances of the exercise of this power by the popes, will be found detailed under the separate articles which refer to the particular popes or sovereigns who engaged in the contest of church and state.—See Gosselin's *Pouvoir du Pape au Moyen Age*.

TENACITY (Lat. *tenacitas*, power of holding) is that property of material bodies by which their parts resist a force employed to attempt to separate them. It is the result of the attractive forces exerted by the particles of matter upon one another through the infinitesimally small spaces which are supposed to exist between them; hence it differs in different materials, and even in the same material at different degrees of temperature. The practical bearings of the tenacity of solids (especially of wood and iron) are discussed in the article STRENGTH OF MATERIALS; and we shall therefore here only state a few of the conclusions at which Muschenbroek and other experimentalists have arrived regarding the modifications which the tenacity of metals undergoes in consequence of various processes. Forging and wire-drawing increase the tenacity of metals in longitudinal direction. Copper and iron have this property more than doubled, while gold and silver have it more than trebled by these metals being drawn into wire. Mixed metals have usually a greater tenacity than simple ones. See ALLOY.

TENAILLE, in fortification (q. v.), a work in low relief, constructed immediately in front of the curtain. It may either have two faces, in a line with the faces of the adjoining bastions, and meeting at the center in a re-entering angle; or three faces, of which two are prolongations of the bastion faces, and one parallel to the curtain. The *tenaille*

must be low enough for the defenders to be safe from the musketry-fire on one bastion defending a breach in the other bastion. This work is of great use in protecting the ditch, covering the postern from the enemy's view, etc.

TENANCY AT WILL, in point of law, means an occupation by a person in the character of a tenant, but for no fixed term other than the will or caprice of the landlord or proprietor. In general, courts are averse to assume a tenant to be a tenant at will, if there are materials to satisfy the description of a yearly tenant. Rent is payable, under a tenancy at will, according to the time of occupation, and the tenancy can be determined by either party at any time. But the tenant is not to be prejudiced by the sudden determination of the tenancy, so that if he has sown the lands, he is entitled afterward to re-enter the lands, to reap the crops; and, in like manner, he has a reasonable time to remove his furniture.

TENANCY IN COMMON, in point of law, means a right to hold or occupy lands, or possess chattels, along with another or other persons. In such a case, each has an equal interest; but in the event of the death of either, his share does not go to the survivors, as is the case in joint tenancy (q.v.), but to his heirs or executors. Tenancy in common applies to ownership as well as leasehold interests. Though each tenant has as much right to the whole property as the others, yet neither has a definite share set apart to himself exclusively. If one wastes or deals with the property to a greater extent than his share, the others can bring an action against him. Each can at any time compel a severance of the property, so that thereafter he may have his own share severally.

TENANCY IN COMMON (*ante*). The undivided interests of tenants in common need not be acquired at the same time or by the same title by all the tenants, and they need not be the same in amount. The share of each tenant is subject to his debts, and to dower and courtesy. His power over it is absolute. He may make a conveyance of it, devise it by will, or incumber it by mortgage. In most of the states the common law rule has been so changed by statute that what would be a joint tenancy in England is in this country a tenancy in common; so that persons who take land in undivided shares by will or deed are tenants in common. A tenant in common can always compel partition. See PARTITION.

TENANCY ON SUFFERANCE differs from a tenancy at will in this, that a tenant at will enters on a good title, whereas a tenant on sufferance has no title, and wrongfully continues. Thus, when the term has ended, and the tenant has got notice to quit, but does not, he continues a tenant on sufferance, and may be ejected at any time, unless the landlord elect to treat him as a tenant in continuation of the former lease.

TENANT FOR LIFE, in English law, means one who has not the absolute property, but an interest in the property, which ceases with his own life, or the life of another. An estate for life in lands is classed with freehold estates. Where the estate for life depends on the life of a third person, as it is the interest of the tenant that such third person should live as long as possible, frauds are often committed on the reversioner by misrepresenting the fact of such person being alive; hence, to prevent fraud, the reversioner may insist on the third person being produced, failing which he will be taken to be dead. An estate for life is usually created by deed, but there are two legal estates for life—namely, the widow's estate in dower, and the husband's estate by courtesy on his wife's death. As a general rule, a tenant for life of real estate is entitled to take wood to repair and burn in the mansion of the estate; but he cannot for other purposes fell the trees, nor open mines or pits, though, if these have been already opened, he may carry them on. Sometimes a tenant for life is declared by the deed or will to be tenant without impeachment of waste, in which case he can exercise most of the rights of an absolute owner, except cutting down ornamental timber, or defacing the family mansion. Tenants for life may now apply to the court of chancery for leave to raise money to drain the lands and make improvements. When a tenant for life dies between the usual terms for drawing rent, the rent is apportioned between his executors and the party next entitled. A tenant for life is called, in the law of Scotland, a life-renter (q.v.).

TENANT IN FEE SIMPLE, in English law, is the old feudal description of one who is absolute owner, the fiction being that all were originally tenants of the crown. A tenant in fee simple has a freehold estate of inheritance, which is the highest degree of property known to the law. There is practically no feudal connection with the crown, and he can alienate or devise the property without the leave or sanction of the crown. A tenant in fee simple has an absolute right to the soil and the mines down to the center of the earth, and has a right to build as high as he pleases. If he dies, the estate goes to his heirs, i.e., his heirs general; but he has power to devise it to whom he pleases, subject to certain restrictions, in cases where the donee is a charitable corporation or trustee for charitable purposes. See MORTMAIN. A tenant in fee simple is called, in the law of Scotland, a fiar (q.v.).

TENANT IN TAIL. See TAIL, ESTATE.

TENANT-RIGHT. This term is used by tenants to denote the various claims of right which they may maintain against their landlords, such as the right of occupancy not subject to removal; and the right to occupy at a rent not subject to increase on the ground of improvements; it being said to be inequitable to make

them pay rent for what they have themselves produced. It is in Ireland that the claims have always had most importance. In Ulster, and in the north of Ireland generally, the equity of them has long been recognized and acted upon. In the south of Ireland, on the other hand, tenant-right was never conceded by the proprietors; while the right of occupancy not subject to removal, has, *de facto*, been enjoyed by the tenants. The non-settlement of the question was long the cause of bitter controversy, and undoubtedly its evil condition was the root of much of the national misery. Owing to the old tenure of land as tribal or clan property, the people of the south of Ireland never received into their minds the notion of "contracting" with any one as the "owner" of land. They had the traditional feeling of being themselves the owners; and so much was this feeling a source of agrarian disturbances, that few Irish "landed proprietors" have ever ventured fully to exercise their rights of property. And nothing was more common in the south than to find that the land had been in the occupancy of the same families from time immemorial without lease or contract of any kind.

The discontent in Ireland continued unabated till the British government interfered and settled the claims, in so far as was practicable at the time, on equitable principles. The passing of the landlord and tenant act of 1870, marked an epoch in the history of Ireland. Under it the Ulster tenant-right custom and all corresponding customs received the force of law, and when the matter did not admit of being regulated by a definite custom, the outgoing tenant became entitled to compensation from the landlord to an amount varying from one to seven year's rent, according to circumstances. The act also contained various provisions, giving compensation for improvements. It would be too much to say that this act has produced contentment, but it has greatly diminished the dissatisfaction, and has opened the way to the ultimate solution of the whole question. To Mr. Gladstone is due the principal share of the honor of passing it, but some of its best clauses were the work of Mr. Bright.

The Irish claim of tenant-right very much resembles that made by the Indian ryots against their zemindars. In India, as in Ireland, until what may be called recent times, land belonged to families or communities, which held themselves to be composed of kindred; but by acts passed by our government, a class of mere tax-collectors have been converted into land-owners, in order to facilitate the collection of the revenue. Hence, there has been in India an agitation very much resembling that which prevailed in the south of Ireland. The ryot claim of tenant-right was made the subject of a suit before the supreme courts of India, when a majority of the judges favored the equitable claim of the ryots. In countries where the people have been trained in notions derived from the Roman or feudal laws, there has been little heard of this species of claim of right, and land has been recognized by the people as being, like other things, a fair subject for contract.

In Scotland and in the north of England farms are almost always let on long leases, and at such rents as are supposed to repay the tenant the capital which he may lay out in improvements; and the common case is, that the landlord binds himself to pay the tenant a stipulated sum as the value of his improvements, provided that these are found at the end of the lease to be of a certain stipulated value. Over England generally, on the other hand, tenancy can be ended by six months' notice on either side, and the evils incidental to this precarious tenure have been obviated or mitigated solely by the honorable conduct of the English proprietors. It is quite common in England to find that the son has succeeded the father as tenant-at will for many generations, often for centuries.

Since the admission of the claim to tenant-right in Ireland, it has been more frequently heard of in the other parts of the United Kingdom, especially in the form of a claim to compensation for permanent or unexhausted improvements made by the tenant. Of the equity of this claim there can be no doubt, and the law might easily be altered so as to admit of effect being given to it. As matters at present stand, there is little inducement for a tenant to improve the land. The law by which the ownership of improvement follows the ownership of land, is in the present condition of things in the highest degree unjust and inexpedient. The tenant's interest in all his improvements ending with his tenancy, he is very unlikely, at least toward the end of his term, to spend anything on the land which will be of benefit to it; and where he is a tenant-at-will, he is entirely without interest to improve it.

TENASSERIM, acquired by Britain after the war in 1825, is the third or southernmost division of British Burmah* (q.v.)—the other two divisions comprising the ancient kingdoms of Pegu and Aracan. On Jan. 31, 1862, these three maritime provinces were united under one local administration, bearing the name of British Burmah.

Tenasserim is a narrow line of coast about 500 m. in length, with a varying breadth of from 40 m. at its southern extremity to 80 m.; the latter distance being measured from the sea-shore at the mouth of the Salween to the range of mountains on the e. that separates Tenasserim from Siam. It extends lengthwise from the southern

*The provinces of British Burmah extend along the eastern shore of the bay of Bengal from the Naf estuary, in about 20° 50' n. lat. to the Pak-chan river, in about 10° 15', with a coast-line of 900 English miles. Their area and population, according to the latest returns, 1872, are as follows: Aracan, area 14,526 sq.m., pop. 484,363; Pegu, area 27,300 sq.m., pop. 1,662,058; Tenasserim, area 46,730, pop. 600,727.

border of Pegu in $17^{\circ} 50'$ n. lat. to near the tenth parallel of n. lat., and from $97^{\circ} 30'$ to $99^{\circ} 36'$ e. long., and has a total area of 46,730 sq. miles. Tenasserim is divided into six administrative districts, besides the town of Moulmein: Toungu, area 6,354 sq.m.; Schwe-gyen, 5,567 sq.m.; Salwen, 4,646 sq.m.; Amherst, 15,193 sq.m.; the town of Moulmein, 10 sq.m.; Tavoy, 7,200 sq.m.; and Mergui, 7,760. The principal town is Moulmein, the next in importance being Toungu and Mergui.

Physical Features.—The general aspect of the country is bold and picturesque. The numerous wooded ranges of hills take generally a course from n. to south. The northern part of the country is the most level; the southern portion is little else than a wilderness of thickly-wooded hills, inclosing long and narrow valleys. The soil of the plains is very fertile, and suited to the growth of rice, indigo, cotton, sugar, and vegetables. Tobacco grows chiefly on the banks of rivers in the hills. Only about $\frac{1}{3}$ of the country is under cultivation, and the forests occupy two-thirds of the entire area. The chief rivers are the Salwen, Gyne, Attaran, Yé, Tavoy, and Tenasserim. The Tenasserim, from which the country derives its name, is the most considerable river of the province. The principal ports of Tenasserim are Moulmein (q.v.), Amherst, Tavoy, and Mergui, of which Moulmein is the best. Amherst harbor, at the mouth of the Salwen, affords good anchorage for ships of any draught of water, but is difficult of approach. The Mergui archipelago, lying off the southern coast of Tenasserim, consists of almost innumerable islets, some of which are said to be rich in iron ore; and they are famous for their edible birds' nests. Numerous anchorages are found among the islands. The country possesses vast stores of mineral wealth, which now lie absolutely neglected. Gold-washing has been pursued with success at the head of the Tavoy river. At Kahan, on Mergui island, are rich and accessible tin-mines; and thousands of tons of good clean ore, yielding 75 per cent of the pure metal, could be raised not far from the surface of the ground. A very productive iron ore is obtained from Iron island, between Tavoy and Tiger island. Mergui province furnishes a valuable lead ore, and has extensive fields of coal. Manganese has been found on the Tenasserim river, where it is believed to be very plentiful.

Botany.—The botanical productions of Tenasserim may vie with those of any part of the world. There are more than one hundred different kinds of timber-trees, of which the teak is the most important. The celebrated *Amherstia nobilis* is the most splendid of the many flowering and ornamental trees for which Tenasserim is famous. The palm tribe are in great variety, and Dr. Griffith collected 1700 different species of plants in about 14 months.

The *climate* of Tenasserim is regulated by the monsoons; and the wet and dry seasons divide the year into two nearly equal parts. The average yearly fall of rain is about 194.28 inches, and this descends during the six rainy months from May to October. The greatest amount of rain ever recorded as having fallen in one day (May 27, 1857) is 12.75 inches; and the gauge for the week registered 40.27 inches (Dr. Walter). While the rains last, the temperature is very uniform, the thermometer ranging between 76° and 82° . The cool season lasts from the cessation of the rains in October, when the north-east monsoon begins, to the middle of February. During that time, the thermometer seldom reaches 90° in the shade, and occasionally falls at low as 56° , and now occurs the greatest thermometric range, which is sometimes as much as 30° in one day. The sun then gradually regains its power, and the heat increases daily till the south-west monsoon again brings clouds and rain. In the hot period, the thermometer at mid-day is not often below 92° in the shade, and not unfrequently stands at 95° .

Commerce.—The principal exports from Tenasserim are teak, timber, and rice. The trade of the province is, however, not on the increase. The first two articles of export mentioned are not continuous from year to year; and we accordingly find that the decrease in the value of trade is owing to the diminished demand for teak timber. Indeed the defective continuity of supply is to some extent a fact also as regards timber. Rice is the most reliable article of commerce.

Inhabitants.—In 1872 the pop. of the Tenasserim districts was as follows: Toungu, 86,166; Schwe-gyen, 129,485; Salwen, 26,117; Amherst, 193,468; Moulmein (town), 46,472; Tavoy, 71,827; Mergui, 47,192; total pop. of Tenasserim, 600,727. Most are Burmans proper, but there are other races, as Talaings, or descendants of the ancient Peguans; Karens, a dispersed people, inhabiting secluded mountain districts—among whom Christianity has made some progress, through the labors of American missionaries; Tounghoos, Khyengs, Shans, Europeans and their descendants, Chinese, and Indians. Throughout Tenasserim and British Burmah generally, inheritance and marriage are regulated by Buddhist law, while at the sea-ports the English mercantile law and law of contracts are in force, and regulate the decisions of the courts.—*The Natural Productions of Burmah and the Tenasserim Provinces*, by the rev. F. Mason, A.M. (Moulmein, 1850); *Six Months in British Burmah*, by Christ. T. Winter (Lond. 1858); *The Tenasserim and Martaban Directory* (Moulmein, 1857); *Reports of the Administration of the Province of British Burmah, for 1861–1862, and 1863*, by lieut.-colonel A. P. Phayre, c. b., chief commissioner and agent to the governor-general (Rangoon, 1862, 1863).

TENBY, a small parliamentary and municipal borough, and thriving watering-place, of South Wales, in the county of Pembroke, and 10 m.e. of the town of that name. Its

charming situation on a peninsula, overlooking the bay of Caermarthen, its salubrity of climate, and the facilities for bathing which the extensive sands in the vicinity afford, have made it one of the best and most fashionable watering-places in Wales. A considerable part of the ancient embattled walls of the town still remains. There are also a handsome church and picturesque ruins of a castle. The season lasts from June till October, and the number of permanent winter residents is annually increasing. Fishing is extensively carried on. Pop. '71, 3,180; but during the season the number is greatly increased.

TENCH, *Tinca*, a genus of fishes of the family *cyprinide*, of a thick form, with small scales, and a barbel at each side of the month, the teeth on the pharynx compressed and club-shaped. The COMMON TENCH (*T. vulgaris*) is an inhabitant of ponds and other stagnant waters in Europe and the north of Asia. It passes the winter in a torpid state, concealed in the mud. It is of a deep yellowish-brown color, more rarely golden or greenish. Instances have occurred of its attaining a length of 3 ft., but a tench of half that length is unusually large. It is very tenacious of life, and, like the carp, can be conveyed to a distance alive in wet moss. It spawns in May and June, depositing its spawn among aquatic plants. The ova are very small and very numerous. The flesh of the tench is soft and insipid, except when it is very well fed, when it becomes delicate and pleasant. It is commonly placed in ponds along with carp; a much smaller number of tench than a carp, however, being deemed sufficient to stock a pond. In Britain, the tench is found only in England, and there sparingly in some of the slow and muddy rivers. It is not improbable that it may have been originally introduced as a pond-fish, although it has long been naturalized. Angling for tench resembles angling for carp. The same kinds of bait are used.

TENCIN, CLAUDINE ALEXANDRINE GUÉRIN DE, 1681-1749; b. Paris; at first a nun; absolved from her vows in 1714. She lived in Paris with her brother, afterward cardinal, where she gained riches out of John Law's schemes. She was the mistress of cardinal Dubois, and of the regent, and other eminent men; and was the mother of D'Alembert by the poet Destouches. She was arrested, but acquitted, in 1726, on the charge of having endeavored to make away with La Fresnay, one of her numerous admirers, who had committed suicide at her house. She was the friend of Fontenelle, Montesquieu, and other literary men. Among her works are: *Le Siège de Calais*, an historical novel (1739-40); and *Les Malheurs de l'Amour* (1747).

TENDA, COL DE, a pass over the Maritime Alps. See ALPS.

TENDER, as a legal term, means the formal offer to perform some obligation incumbent on the person tendering. It is more frequently used in reference to the payment of money which is due. Whenever a tender of the debt is properly made, the legal consequence is this, that if the money is refused, the creditor will have to pay the costs of any action he may bring to recover it, and cannot claim interest afterward. In case such an action is brought, the debtor has nothing to do but to plead that he duly tendered the money, and if he then pay into court the sum which he had formerly tendered, the other party must stop the action, or continue it at his own risk. In order, however, that a tender should have the above effect, it must have been duly made—that is to say, it must have been made without imposing any conditions on the creditor, and at the proper time and place. The tender must be in money, and not by bill of exchange; but Bank of England notes are a good tender for all sums above £5. If the debt is beyond 40s., it ought to be in gold, so far as it goes. Though other bank notes than Bank of England notes are often tendered, the creditor is not bound to accept them; but if he take them without any specific objection, then it will be a sufficient discharge. A tender of a larger sum than is due is good, but must not require change to be given, which the creditor is not obliged to find. Nor must any condition be annexed to the tender, not even the condition of giving a stamped receipt, though on other grounds, by statute, a person receiving payment is bound to fill up a stamped receipt on its being tendered to him, and to pay the stamp; and his refusal to fill up the receipt subjects him to a penalty of £10. A tender of payment must, in general, be made to the creditor at the place he has indicated, and it is the duty of the debtor to find out and pay the creditor. With regard to payment of rent, however, it is enough that the tenant be ready to pay the rent on the premises at the time it is due, it being the landlord's duty to send or call for it, for the land is the proper debtor, and that is the place to apply to in the first instance.

TENDER, in naval language, a small vessel appointed for the service of a larger one. Steam gunboats are most commonly employed as tenders.

TENDON is a term employed in anatomy to designate the white fibrous tissue reaching from the end of a muscle to bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. In accordance with their form, tendons have been divided into the three following varieties: (1) *Funicular*, or rope-like, as the long tendon of the biceps muscle of the arm; (2) *Fascicular*, as the short tendon of that muscle, and as the great majority of tendons generally; and (3) *Aponeurotic*, or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles.

The tendons commence by separate fascicles from the end of each muscular fiber,

and they similarly terminate by separate fascicles in distinct depressions in the bones, besides being closely incorporated with the periosteum. In some birds, whose tendons are black, the periosteum is black also, from this incorporation. If a tendon is ruptured by an accident, or divided by the surgeon, the two ends, if not too far separated, unite with extreme readiness, by the formation of intervening plastic material, which soon acquires great firmness. So rapidly is this process of repair carried on, that, according to Mr. Paget, a specimen, six days after division, could bear the weight of 25 lbs.; while in another specimen, the new material, at the end of 21 days, bore a weight of 56 lbs. When the interval between the two ends of a tendon exceeds a certain limit, there will be only an imperfect bond of union, and either a partial or total loss of the use of the muscle will result. For details regarding this process of repair, which has an intimate bearing on the treatment of ruptured tendons, the reader is referred to Mr. Paget's admirable *Lectures on Surgical Pathology*.

Among the diseases of tendons, inflammation requires especial notice. "Tendons," says Mr. Tatum, in his article upon *Affections of the Muscular System*, "together with their sheaths, are not unfrequently inflamed. Independently of gout and rheumatism, the most frequent cause is a sprain or wrench in the neighborhood of a joint. These injuries are occasionally productive of long-continued wearing pains, assuming much of a rheumatic character, and yield often slowly and unwillingly to the remedies, both local and general, employed in rheumatism."—Holmes's *System of Surgery*, vol. iii, p. 544. In one of the forms of whitlow (q.v.), known as *paronychia gravis*, or *tendinous whitlow*, "the tendons and their sheaths in the finger and hand are the seat of a severe and often most destructive inflammation, which, though often confined to one finger, not unfrequently extends to the hand and arm, attacking not only the tendons and softer parts, but exposing the bones, and disorganizing the joints."—*Op. cit.*, p. 544. It arises from slight punctures or wounds, with or without the inoculation of irritant or poisonous matter, and often without any apparent cause, except a derangement of the general health. It begins with severe and throbbing pain in the palmar surface of a finger, which extends upward along the arm. There is extreme tenderness, and a certain amount of redness and swelling, with great tenseness of the parts. If the inflammation is not checked, suppuration soon ensues, accompanied by much constitutional disturbance. The matter frequently extends among the muscles, and in bad cases occurring in unhealthy persons, the bones and joints became affected in the way already mentioned. In the early stage, free leeching, followed by hot fomentations, may be useful. The hand should be kept elevated, and an active purgative, with low diet, prescribed. If, as is often the case, these measures are unsuccessful, a free incision must be made along the center of the palmar aspect of the finger—an operation which gives extreme relief, by removing the tension, and allowing the escape of blood, even if little or no pus is discharged. A generous diet, stimulants, and tonics, are now advisable; and under this treatment the disease generally yields; although cases occasionally present themselves in which the suppuration produces such results as to render amputation of the arm necessary, or even to cause death. A permanently bent finger, from adhesion of the tendon to its sheath, is a common result in severe cases of whitlow of this kind.

Tendons are not very unfrequently the seat of syphilitic enlargements or tumors. Malignant tumors scarcely ever spring from tendons, but fibrous tumors and small cartilaginous enlargements are often found in tendons.

Rupture of the tendons is an accident which is frequently caused by violent muscular action, especially if, from illness or other causes, the muscles have been for some time in a state of inactivity. The long tendon of the biceps cubiti is very obnoxious to this injury, which, in this case, is more often due to the disorganization caused by chronic rheumatic gout than to mere mechanical violence. The other tendons most frequently ruptured are the tendo Achillis, and the tendons of the rectus femoris and the triceps humeri. When a tendon is ruptured or divided by a surgical operation (tenotomy), "the part which is attached to the muscle is drawn away from the opposite end for about an inch. Blood is poured out between the ends, but much less than in rupture of muscles. The pain is said not to be very great; a considerable shock, however, is felt, as from a blow received on the part, accompanied by cramp of the muscle, and a perfect inability to use the limb; and in rupture of the tendo Achillis, a feeling is described as if the heel were sinking into a hole in the floor."—Holmes's *System of Surgery*, vol. iii, p. 541. The essential point in the treatment of ruptured tendon is to keep the injured part in a state of constant rest and muscular relaxation, so that the separated ends may be approximated as much as possible, and to prevent any violent extension till firm union, by the process of reparation, has been established. The special methods of treating individual cases (as rupture of the tendons of the rectus femoris and the triceps, and of the tendo Achillis) are discussed in Holmes's *System of Surgery*, and other standard works on surgery.

TENE'BRIO. See MEAL-WORM.

TENEDOS (Turk. *Bogdsha-Adassi*), an island belonging to Turkey in the n.e. of the Ægean sea, off the coast of the Troad, and about 17 m. s. of the western entrance to the strait of the Dardanelles. It is about 5 m. long by 2 broad, rocky, but not unproductive, with a pop. of more than 6,000, who are partly Greeks and partly Turks. The

chief t., also Tenedos, or *Bogulsha*, has a trade in wine. Opposite Tenedos, on the coast of Asia Minor, is the bay of Besika, whither the English fleet was sent in 1877.

TENEMENT, in the strict legal sense, includes everything of a permanent nature that may be an object of tenure, whether corporeal or incorporeal. The phrase *liberum tenementum*, or freehold, is thus applicable to officers and rents as well as to real estate. The term tenement took its origin in the feudal system, where all lands were held on condition of pecuniary or military service to a feudal lord; and the real estate or incorporeal hereditament became known as the *holding*, or *tenement*. The common use of the word to denote leased or rented houses is derived from the fact that such property was always occupied by tenants rather than by owners in fee. It is now very generally used to indicate rooms let within a building devoted to that purpose.

TENERA'NI, PIETRO, 1789-1869; studied sculpture with Thorwaldsen and Canova at Rome. Among his more famous works are the "Angel of the Last Judgment," the sarcophagus of Pius VIII. for St. Peter's; "Christ on the Cross," at St. Stephen's in Pisa; and "Flora," now owned by queen Victoria. He also made many statues and busts. He was professor at the academy of St. Luke, and in 1860 director of Roman museums.

TENERIFFE, the largest of the Canaries (q.v.).

TENERIFFE, PEAK OF, or PICO DE TEYDE, a famous dormant volcano, the highest summit in the Canary islands, stands in the s.w. of the island of its own name, and is 12,182 ft. above sea-level. The lower slopes of the mountain are covered with forests, or laid out in extensive meadows, yielding rich grass; but the upper ridges, and the peak, properly so called, are wild, barren, and rugged in appearance. The peak and its two inferior neighbors—the *Montana Blanco* and *Chojorra*—rise from a rugged circular plain of lava debris and pumice, 7,000 ft. above sea-level, about 8 m. in diameter, and fenced in on all sides by an almost perpendicular wall of rock. From the crevices of these mountains sulphurous vapors are constantly exhaling. The peak can be seen from a distance of upward of 100 m.; but the view from it is generally destroyed by the dense masses of cloud which hang over the surrounding sea at an average elevation of 4,000 to 5,000 ft., the sky above being almost uniformly clear and bright. Mr. Piazzzi Smyth, in the summer and autumn of 1856, made here a series of experiments for the purpose of ascertaining how far astronomical observation could be improved by eliminating the lower third part of the atmosphere, and with this object observed for two months, first on Guajara (an elevated peak of the rocky wall, 8,903 ft. high), and afterward on Alta-Vista (on the side of the peak, 10,702 ft. high). See *Teneriff*, by C. Piazzzi Smyth (London 1858).

TENES, a rising sea-port of Algeria, 100 m. w. of the city of Algiers. It is happily situated for commerce, is the entrepôt for Orleansville, and the depot for the supply of the army with provisions. It is at once fortunate in the agricultural resources of its territory, in its mineral wealth, and its position in respect to transit-trade. Pop. (of commune in 1871), 8,000.

TENESMUS (from the Gr. *teinein*, to strain), is the term employed in medicine to designate a straining and painful effort to relieve the bowels when no fecal matter is present in the rectum; the effort being excited by some adjacent source of irritation. All that is got rid of by the straining, which usually occasions more or less descent of the gut, is mucus, frequently stained with blood. Tenesmus is a common symptom in dysentery, irritation of the bladder, stricture of the urethra, etc.

TENIERS, DAVID, the elder, a Flemish artist of note, was born at Antwerp in 1582. For some years he was a pupil of Reubens; afterward, he visited Italy, where he studied under Adam Elzheimer, and, on his return, settled in his native city, where he died in 1649. The subjects of Teniers's pencil are, in general, very homely, and often low—the interiors and exteriors of public-houses, smoking-rooms, rustic games, weddings, etc.; but they are executed in the most vividly realistic manner, with such charm of color, and happy ease of composition, that they never fail to excite in the beholder a lively sense of pleasure. Teniers was almost constantly employed during his career as an artist.

TENIERS, DAVID, the younger, son of the preceding, was born at Antwerp in 1610. He received his first lessons in art from his father, who, it is said, subsequently placed him in the studio of Adrian Brauwer; but this statement can scarcely be true, for Brauwer (q.v.) was only two years older than himself. It is probable that he derived most, if not all his professional instruction from his father, to whose genius his own bore a peculiarly filial resemblance. In fact, the elder Teniers may be considered the founder of a school of which the younger is the most brilliant and prolific member. The latter, like his parent, rapidly rose into distinguished consideration, enjoying in the course of his life the favor and friendship of the archduke Leopold, queen Christina of Sweden, Don John of Austria, the prince of Orange, the bishop of Ghent, and other dignitaries. Teniers lived for the most part in a villa on the outskirts of Malines, where he had abundant opportunities of studying closely that humble rustic life which he has so charmingly depicted in all its aspects; but he died at Brussels Feb. 11, 1685. He was twice married—first, to a daughter of the painter Breughel (q.v.), *Velvet* Breughel as he was called; and again to the daughter of a counselor at the court of Brabant. The

number of his pictures is something marvelous. Smith, in his *Cutalogue Raisonné*, has carefully described 685. England is peculiarly rich in specimens, but they are also literally scattered over the galleries and private collections of the continent, and, in spite of their number, bring great prices. They possess, but in a superlative degree, the beauties of the elder Teniers's pieces. In the coloring of his skies, the sketching of his trees, the animation and grouping of his figures, we see everywhere the presence of a richer, finer, more observant and more imaginative genius.

TENNANT, WILLIAM, still to be remembered as the author of *Anster Fair*, was born at Anstruther, in Fife, in the year 1785. A cripple almost from his birth, and doomed to propel himself through life on crutches, he betook himself naturally to study, as requiring no exertion of the limbs. In 1799 he went to the neighboring university of St. Andrews where, however, he only remained two years, leaving it to join his brother, a corn-agent, in business. In this his success was indifferent; and in 1813 he was fain to accept the situation of parish school-master at Denino, a small hamlet about 4 m. from St. Andrews, with a salary of £40 a year. The year before, he had published his *Anster Fair*, a poem of much sprightliness and humor, notable as the first attempt to naturalize in our language the gay *ottava rima* of the Italians; by Byron, soon after adopted with such splendid success in his *Beppo* and *Don Juan*. The piece gradually made its way, and in 1814 a highly laudatory notice of it appeared in the *Edinburgh Review*, from the pen of the then omnipotent Jeffrey. In 1816 Mr. Tennant became teacher of a school at Lasswade, near Edinburgh, whence three years afterward, he transferred his services to the academy of Dollar in Clackmannanshire. His attainments as a linguist were extraordinary; and in 1835 he was appointed professor of oriental languages in the university of St. Andrews—a post for which, perhaps, not many men then living had similar qualifications. In connection with his new duties, he published, in 1840, grammars of the Syriac and Chaldee languages. He died Feb. 15, 1848, at his residence near Dollar, where his summers were usually spent. He was one of the most genial and amiable of men. Besides other miscellanies in verse, he gave to the world, in 1822, *The Thane of Fife, a Poem*; in 1823, *Cardinal Beaton, a Tragedy*; and in 1825, *John Babiol, a Drama*. None of these later productions had much success, or did anything to increase the literary reputation which his first work had won for him.

TENNENT, GILBERT, 1703-64; b. Ireland; came to America with his father, 1718, and aided him in an academy in Philadelphia; studied medicine and theology; was ordained pastor of a Presbyterian church in New Brunswick, N. J., 1726, continuing the connection until 1743, though traveling and preaching with Whitefield in New England for several months; founded and became pastor of a church in Philadelphia, with which he remained connected until his death. In 1851 he visited England with president Davies to obtain aid for the college of New Jersey. He published *Lawfulness of Defensive War; Sermons on Important Subjects*.

TENNENT, Sir JAMES EMERSON, LL.D., 1804-69; b. Ireland; educated at Trinity college, Dublin, and called to the bar. He was a member of parliament, 1832-45; secretary to the India board, 1841-45; and civil secretary to the Ceylon colonial government, 1845-50. He was again elected to parliament in 1852, was secretary of the poor law board the same year, and a joint secretary of the board of trade, 1852-67, when he was made a baronet. Under his original name of Emerson (Tennent being added on his coming into the estates of his wife, a daughter of William Tennent), he published *Travels in Greece* (1825); *Letters from the Aegean* (1829); and *History of Modern Greece* (1830-45). Among his later works are *Christianity in Ceylon* (1850); *Account of Ceylon* (1859); *Sketches of the Natural History of Ceylon* (1861); and *The Story of the Guns* (1864).

TENNENT, WILLIAM, D.D., 1705-77; b. Ireland; brother of Gilbert; came to America, 1718. While studying theology he was attacked with fever, and fell into a trance, giving no sign of life, except a slight tremor under the left arm, which led the physician to refuse consent to his interment, and the funeral was postponed for three days, when vitality became perceptible. His recovery was slow and painful, for months his memory and mental faculties seemed lost. At length he felt a sudden shock in his head, and by degrees recovered his recollection. He related that at the time of his apparent death he found himself in the midst of wonderful glory, among a multitude singing very sweetly, and that when about to join them some one said to him, "You must go back." At the shock of this announcement he awoke. He was ordained in Freehold, N. J., 1733, and continued the pastor 44 years. He published a few sermons.

TENNESSEE, a river of the United States, the largest tributary of the Ohio, has its origin in the union of the Clinch and Holston, which rise in the Alleghany mountains of south-western Virginia, and, flowing s.w. in two parallel valleys, unite at Kingston in the w. of Tennessee state. The river flows still s.w. in the Alleghany valley, entering Alabama close by the n.w. corner of Georgia, whence it flows 60 miles further in the same course, then, turning to the w.n.w., re-enters Tennessee at the n.e. corner of Mississippi, flows northwardly across the state, then n.w. across Kentucky to its confluence with the Ohio at Paducah; length 800 miles, or, from the source of the Holston, 1100. Its chief branches are the Sesquatchie, Paint Rock, Flint, Duck, North Branch, Hiawasse, Big Sandy,

and Clark's. It is navigable 259 miles to Mussel shoals—a series of broad shallow rapids—and 500 miles above. Chief towns, Florence and Decatur in Alabama; and Chattanooga, Tennessee.

TENNESSEE, a southern state of the American union, the third admitted under the federal constitution, extends in lat. 35° to 36° 30' n., and long. 81° 37' to 90° 23' w.; and is bounded on the n. by Kentucky and Virginia; and on the s. by Georgia, Alabama, and Mississippi. Area, 45,600 sq. miles. The chief towns are Nashville (the capital), Memphis, Knoxville, Chattanooga, Murfreesborough, and Jackson. The principal rivers are—the Mississippi, forming the boundary on the w.; the Cumberland (q.v.), the Tennessee river, which twice crosses the state; the Obion, Hatchee, and numerous branches of the larger rivers, which give navigation and water-power to the entire state. Eastern Tennessee is crossed by several ridges of the Alleghany mountains, some of which have elevations of 2,000 ft.; the middle region between the Cumberland and Tennessee rivers is hilly, and the w. level. The western portion of the state, between the Mississippi and the Tennessee, is of the alluvial and cretaceous formation of the shores of the Atlantic and gulf of Mexico. Extensive iron mines lie between the Tennessee and Cumberland rivers. In the limestone regions are numerous caves, mostly unexplored. Several in the Cumberland mountains are 100 ft. deep, and miles in extent. A considerable river has been discovered in one at a depth of 400 ft.; another opening perpendicularly in a mountain has never been fathomed. In some of these caves are large deposits of fossil bones of extinct animals. In the Enchanted mountain are seen impressions of the feet of men and animals in limestone. Tracts of several acres have sunk into caverns 100 ft. deep. In many places are interesting remains of ancient mounds and fortifications.

The climate of Tennessee is temperate, and, except in some of the river-bottoms, salubrious. The soil of the whole state, except the eastern mountainous regions, is extremely fertile, producing cotton, tobacco, Indian corn, wheat, figs, peaches, grapes, and all the fruits and productions of the southern temperate regions. The state is richly wooded with pine, oak, hickory, sugar-maple, cedar, black walnut; and the woods abound in game, as bears, deer, opossums, racoons, foxes, etc.; and the country is rich in horses, cattle, sheep, and swine—the last running in large herds in the woods, and fattening on nuts. In 1870 farms averaging 166 acres in size occupied 19,581,214 acres of land, of which 6,843,278 were improved. In the same year the live stock was valued at \$55,064,075; and the crops consisted in part of 41,343,614 bushels Indian corn, 6,183,916 bushels wheat, 21,465,452 lbs. tobacco, and 181,842 bales cotton. The commerce of the state, by its rivers and 23 lines of railway, is chiefly with New Orleans, St. Louis, and Cincinnati. There are state asylums for deaf and dumb at Knoxville, and for the insane and blind at Nashville. There are 51 colleges; a common school-fund of \$2,500,000; 2,842 churches, chiefly Methodist, Baptist, and Presbyterian; 9 daily, 110 weekly papers. The value of property in 1874 was \$289,533,656; the bonded debt, \$22,968,400.

In 1756 a settlement was formed near Knoxville, then a part of North Carolina. Nashville was settled near the close of the revolution; in 1790 Tennessee was organized as a territory with Kentucky; and admitted, in 1796, into the union as a separate state. In Jan., 1861, a proposal to secede from the union was defeated; but in June, carried by a majority of 57,667. In ten months the state raised 59 regiments for the confederacy; while 5 or 6 were also recruited for the union. The state was the scene, at Knoxville and Chattanooga, of some of the most important operations of the war. Tennessee sends 8 representatives to congress, in addition to the 2 senators allowed to each state. For some years after the civil war portions of Tennessee continued in a very disturbed condition, numerous outrages being committed by bands of disguised marauders. The pop. in 1800 was 105,602; 1820, 422,813; 1840, 829,210; 1860, 1,109,847; 1870, 1,258,373 (of whom 936,119 were white, and 322,331 colored).

TENNESSEE (*ante*) for civil purposes is divided into east, west, and middle Tennessee, and comprises 8 great natural divisions. On its eastern borders rises, in huge, ridge-like masses and treeless domes, the Appalachian chain, the loftiest peaks of which attain an elevation of more than 6,000 ft. above the sea. These mountains are called the Unakas, and they form one of the natural divisions of the state. Adjoining this chain on the w., and inclosed between the Unakas and what is known as the Cumberland table-land, is the valley of East Tennessee, which is one of the most important agricultural regions. Next comes the Cumberland table-land, an elevated plateau 2,000 ft. above the sea and 1000 ft. above the valley of east Tennessee. Then, resting against the western edge of the Cumberland table-land and extending to the Tennessee river, with an average elevation of 1000 ft. above the sea, are the highlands, rimlands, or terrace lands. In the center of these is the great central basin, elliptical in shape, and resembling the bed of a drained lake. Its soil is productive of all the crops suited to the latitude, and it is called sometimes the garden of the state. The western valley forms the sixth natural division, which is comparatively narrow, with spurs from the highlands pointing in toward it and here and there running down to the margin of the Tennessee river. The seventh division is a plateau or slope of west Tennessee, and differs from all the others in having only a few rocks. Its soil is light, porous, siliceous, and very fertile. The eighth division is the bottom of the Mississippi, a low, flat, allu-

vial plain, which has a rank luxuriance of vegetable life that is almost tropical. The eastern mountain-border consists mainly of silurian rocks, and in part is believed to be of the azoic age. It affords asbestos, kaolin, and red, green, and other granites. Valuable copper mines are also found in this region, and the foot hills abound in iron ore, including rich pyrites, limonite, hematite, magnetite, and iron-manganese ores. In the valley of east Tennessee are lithographic shale, heavy-spar, millstone, slate, potter's clay, limestone, native blue vitriol, marble, and ores of lead and zinc. Coal-measures occupy about 5,100 sq.m., mainly occupying the Cumberland mountain plateau, from which an annual product of 400,000 tons is usually derived. Middle Tennessee contains petroleum, alum, gypsum, glass-sand, marble, copperas, fictile clay, and iron. In west Tennessee lignite is found in abundance, and there are beds of green-sand marl. The forests of the state have a large variety of timber-trees. In the east the white and other pines grow across extensive tracts; in the west the larch, cypress, and cottonwood, and nearly everywhere may be found the tulip-tree, hickory, magnolia, sweet and black gum, black and white walnut, cherry, pecan, ash, maple, locust, beech, and several kinds of oak. The general elevation of the state secures it from the oppressive summer heat of the Gulf states, and the winters are in no parts severe. Along a line running e. and w. through the middle of the state the mean temperature is 57° in east Tennessee, 58° in middle, and 59° in west Tennessee. On the southern boundary it is about 1° higher, and on the northern 1° lower. The only sickly region is the swampy part.

The name of the state is derived from Tannassée, the Indian name of the Little Tennessee river. It was permanently colonized in 1754 by settlers from North Carolina, of which province the present state was a part. In 1776, however, it was officially designated the District of Washington; and after the revolution, the people having expressed dissatisfaction with the government of North Carolina, the whole region was ceded to the United States and became an organized territory. In June, 1796, it was admitted into the Union as a state with its capital at Knoxville. At that time there were no settlements in west Tennessee and only a few scattered here and there in middle Tennessee. But the westward tendency of emigration soon led to encroachment on portions occupied by Indians, who were finally removed to the Indian territory in 1819, from which time the growth of the state was rapid. During the rebellion, 1861-65, nearly the whole state was a battle ground. Severe battles took place at fort Pillow, Stone river, Island No. 10, Nashville, Chickamauga, Lookout mountain, Missionary ridge, Knoxville, Franklin, and other places. In April, 1865, the state legislature met in Nashville, ratified the thirteenth amendment to the federal constitution, and reorganized the state government, and the following year the state was readmitted to the union. Though it has been politically disturbed at times since, the state has, for the most part, succeeded well in returning to its former prosperity. In 1870 there were 267,020 persons engaged in agricultural pursuits; 54,396 in professional; 17,510 in trade and transportation, and 29,061 in manufactures and in mechanical and mining industries. By the census of 1880 the total population was 1,542,463, of which 1,139,120 were white, and 403,343 colored.

In agricultural products Tennessee has always ranked high. Its average annual production of Indian corn is about 50,000,000 bushels; of wheat, 8,000,000 bushels; oats, 5,600,000 bushels; tobacco, from 13,000 to 22,000 hogsheads; cotton, 400,000 bales; hay, 110,000 tons; sweet-potatoes, 1,200,000 bushels; Irish potatoes, 1,122,000 bushels; peanuts, 500,000 bushels. There are raised in particular localities hemp, broom-corn, flax, sorghum, and rice; and all the garden vegetables in nearly all parts of the state are raised in abundance. Though the number of acres devoted to barley is very small, it is nevertheless reported to be a profitable product. Rye and buckwheat, however, are not. The dairy products in 1870 were 9,571,069 lbs. of butter; 142,240 lbs. of cheese; and 415,786 galls. of milk. The live stock at that time was valued at \$55,084,075, and consisted of 273,200 horses, 102,983 mules and asses, 682,318 neat cattle (of which 243,197 were milch cows), 826,783 sheep, and 1,828,690 swine. The manufacturing industries of the state in 1870 were increasing rapidly. The number of establishments at that time was 5,317, employing 732 steam engines and 1340 water-wheels, 19,412 hands, and capital amounting to \$15,595,295. The amount of wages paid was \$5,390,630; value of raw material used, \$19,657,027; value of products, \$34,262,636. Among these manufactures were 216 flouring-mills, producing \$5,666,698 worth of flour and meal; 349 saw and planing-mills and sash factories, producing together, \$3,768,976 worth of manufactured lumber; 65 furnaces, blast-furnaces, and foundries, producing \$2,072,040 worth of iron; 395 establishments for tanning and currying leather; 28 cotton mills; 230 wheel-wright shops; 2 copper-milling and smelting works, producing copper valued at \$510,677; 133 wool-carding and dressing mills; 4 cotton-seed oil mills; 44 liquor distilleries; 89 cabinet shops; 21 machine shops; and 4 car-shops. The state has no direct foreign commerce, though Memphis and Nashville are both river-ports of entry. Its large exports of cotton are made through New Orleans, Norfolk, Charleston, and New York. The shipments of cotton (two-thirds of it from Memphis) in 1873 were 613,750 bales, and in 1872, 548,913 bales, the value of which was from 35 to 45 million dollars. The tobacco shipped annually is usually worth two millions more; and altogether the wholesale trade of the state is estimated at \$300,000,000. The amount of transportation, therefore, over the railroads is large. The most important of these roads are the Mobile and Ohio, the

Mississippi Central and New Orleans, the Memphis and Charleston, the Memphis and Ohio, the Mississippi and Tennessee, the Memphis and Paducah, the East Tennessee, Virginia and Georgia, the Nashville and Chattanooga, the East Tennessee and Georgia, the Nashville and North-western, the Jackson and Birmingham, the St. Louis and South-eastern, the Jackson and Evansville, the Selma, Montgomery, and Memphis, the Memphis and Vicksburg, the Louisville, Nashville, and Great Southern, and the Cairo and Tennessee river. Of the banks in the state in 1875, 26 were national, with \$3,360,000 paid capital, \$3,116,500 bonds on deposit and \$3,061,232 circulation outstanding; 11 were state banks with a capital of \$1,442,000; and 8 were savings banks, of which 4 reported a capital of \$263,000. The insurance companies numbered 12 fire and marine and 3 life insurance companies.

Compared with the other states and territories, Tennessee ranks in area twenty-fifth, ninth in population, seventh in lands and farms, ninth in farm products, and fifth in home manufactures. The financial affairs of the state have embarrassed its government for several years. In 1870 the public debt was \$43,052,652, which has been contracted chiefly by railroad enterprises. On Jan. 1, 1880, this amount had been reduced to about \$31,560,000, which was bearing 4 per cent interest. The *ad valorem* tax at that date was \$104,194,574; the revenue received from privileges granted and minor sources, \$295,000; and the current expenses, not including the interest on the debt, \$675,750. The constitution provides that all property shall be taxed according to its value, so that the taxes shall be equal and uniform throughout the state, and that no species of property shall be taxed higher than any other of the same value. But the legislature is empowered to except from taxation property held by the state, counties, cities, or towns that is used exclusively for public or corporation purposes, and such as may be held and used for religious, charitable, scientific, or educational purposes. Accordingly, for many years full advantage has been taken of these provisions, and up to 1875 no railroad nor any other corporations, except insurance companies and a few banks, had ever paid any state tax.

The educational interests of the state until 1873 were much neglected. Though there were many higher institutions, the common schools were allowed to go without system or state aid. At that date the legislature passed a general law establishing schools and made provisions for their maintenance. The total annual income in 1876 from the permanent fund and state taxation was about \$600,000. Besides this, the public schools in various parts of the state received aid from the Peabody education fund to the amount of \$34,300. The school population in 1875 was 319,671 white children and 106,230 colored; the number of pupils enrolled was 198,085; the average attendance (16 counties not reporting), 136,118. Among the universities and colleges in Tennessee the most prominent are Vanderbilt university (M. E. south), Nashville; Fisk university (colored), Nashville; East Tennessee university, Knoxville; East Tennessee Wesleyan university (M. E.), Athens; Cumberland university (Presbyterian), Lebanon; and the university of the South (Protestant Episcopal), at Sewanee. Altogether, these schools, with a few others not mentioned, have usually about 2,800 students. The number of libraries in the state in 1870 was 3,505, with 802,112 volumes, of which 2,732, with 597,299 volumes, were private. The total number of newspapers and periodicals published is about 141, including 9 daily, 110 weekly, 17 monthly, and 1 quarterly. The religious organizations in 1870 were: Baptist, 987; Christian, 203; Congregational, 3; Protestant Episcopal, 33; Friends, 5; Jewish, 4; Lutheran, 22; Methodist, 1339; Presbyterian, 556; Roman Catholic, 21; and United Brethren in Christ, 7.

The state constitution provides that every male citizen 21 years old, who has resided in one county a year preceding an election, shall be entitled to vote. The executive power is vested in a governor, who is chosen every two years; a secretary of state, appointed by a joint vote of a general assembly every four years; a treasurer and comptroller of the treasury, appointed in the same manner every two years; an attorney-general, appointed by the supreme court judges every eight years; and a state superintendent of schools, nominated by the governor and confirmed by the senate every two years. The house of representatives has 75 members and the senate 25, who are elected for two years. The judicial power is vested in a supreme court of 5 judges, elected for 8 years, and in the usual minor courts. By the apportionment of 1870 the state is entitled to 10 representatives in congress. The state's electoral votes have been cast as follows: 1793, Jefferson and Burr, 3; 1800, Jefferson and Burr, 3; 1804, Jefferson and Clinton, 5; 1808, Madison and Clinton, 5; 1812, Madison and Gerry, 8; 1816, Monroe and Tompkins, 8; 1820, Monroe and Tompkins, 7; 1824, Jackson and Calhoun, 11; 1828, Jackson and Calhoun, 11; 1832, Jackson and Van Buren, 15; 1836, White and Tyler, 15; 1840, Harrison and Tyler, 15; 1844, Clay and Frelinghuysen, 13; 1848, Taylor and Fillmore, 13; 1852, Scott and Graham, 12; 1856, Buchanan and Breckenridge, 12; 1860, Bell and Everett, 12; 1868, Grant and Colfax, 10; 1872, Greeley and Brown, 12; 1876, Tilden and Hendricks, 12; 1880, Hancock and English, 12.

TENNEY, in heraldry, orange color, one of the tinctures enumerated by heralds, but not of frequent occurrence in coat-armor. It is indicated in engravings by lines in bend sinister, crossed by other barways.

TENNEY, SAMUEL, 1748-16; b. Mass.; graduated at Harvard, 1772; began practice as a physician in Exeter, N. H.; became a surgeon in the revolutionary army, and was present at the battles of Saratoga and Yorktown. From 1800 to 1807 he was a member of congress. He was one of the first members of the American academy of arts and sciences, and published many scientific treatises and political essays.

TENNEY, SANBORN, 1827-77; b. N. H.; educated at Amherst college, and studied natural history with Agassiz. He was for some years a lecturer on natural history, of which he became professor in Vassar college at its foundation. He was called to a similar position at Williams college in 1868. Among his publications are: *Geology for Teachers, Classes, and Private Students*; a *Manual of Geology*; *Natural History Tablets*; and *Elements of Zoology*.

TENNEY, WILLIAM JEWETT, b. Newport, R. I., 1811; graduate of Yale college, 1832: He was co-editor of the *Journal of Commerce*, of the *New York Evening Post*, and editor of the *Mining Magazine*. He became a member of a staff of writers connected with Appleton's publishing house in New York, and is one of the editors of Appleton's *Annual Cyclopædia*. He has edited an illustrated edition of *The Queens of England*, and prepared *The Military and Naval History of the Rebellion in the United States*, 1865.

TENNIS, a game of great antiquity, belongs to the class of ball-games, and finds its analogies in the *sphairistikos* of the Greeks, and the *pila* of the Romans. Under the name of *paume*, a name given to it from the ball being at that time struck with the palm of the hand, it is noticed in the Arthurian romances, and in the earlier records of the dark ages. In the 15th c. it was in great vogue in France among all classes, from the monarch to the meanest of his subjects; and about this time the use of a heavy glove to protect the hand in striking the ball was introduced, and a further improvement was subsequently effected by the adoption of the *racket*. The game in England kept pace with its progress in France, and, during the 16th, 17th, and 18th centuries, was generally practiced under the name of *tennis*. Many modifications have been introduced, but the legitimate descendant of the *paume* and *tennis* of former days is the present game of rackets. (See LAWN TENNIS). "Rackets" is played in a court 96 or 97 ft. long, by 33 or 34 feet wide, and surrounded by walls sufficiently high to prevent the balls from being lost. The players are either two in number, or four, divided into two parties. The player or party "in" serves the ball against the head-wall of the court, so as to rebound over a line drawn at a certain distance; it is returned by means of the racket by the player or party "out," who must make it rebound from the wall to the other side of the line; and the game is thus carried on till one player fails to strike the ball or cause it to rebound properly. If the player "in" fails, he changes places with the player "out;" if the latter fails, the former scores a point. The part of the court on which the player or party in is placed is called the "service" side; the other the "hazard" side. A similar game played without the racket is called *fixes*, *hand-tennis*, or *hand-ball*.

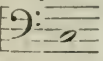
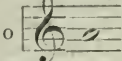
TENNYSON, ALFRED, was born in the year 1809 at Somersby, in Lincolnshire, of which parish his father was rector. He was the third of a large family, several other members of which shared with him in some measure the genius which has won for him undisputed rank as the first English poet of his time. Very early the bent of nature became obvious; and in 1827 Tennyson, along with his brother Charles, issued a small volume, entitled *Poems, by Two Brothers*, of which almost nothing has been preserved. Having gone to complete his education at Trinity college, Cambridge, he gained in 1829 the chancellor's medal by a poem in blank verse, entitled *Timbuctoo*, in which there is plainly to be traced some impress of his peculiar genius. His literary career, however, may properly be said to date from 1830, in which year a volume appeared of *Poems, chiefly Lyrical*, by Alfred Tennyson. It was not received with great favor by the public; but amid much that was weak and immature, it contained pieces which in no indistinct manner announced the advent of a true poet. In a notice of the book by prof. Wilson, in *Blackwood's Magazine*, the promise of the young writer was recognised in sufficiently express terms. The praise was, however, not unminged with censure, which, though it seemed on the whole judicious, did not commend itself as such to the poet, who retaliated on "crusty Christopher" in his next volume, published in 1833. This consisted of a selection of poems from the previous one, carefully retouched by the writer, with the addition of pieces produced in the interval, many of which have scarcely been surpassed in beauty by anything he has since produced. Onward from this time the reputation of the writer slowly but surely extended itself; and the publication, in 1842, of *Poems, by Alfred Tennyson*, in two volumes, raised him to the position of absolute supremacy which he has ever since continued to occupy by almost universal consent. In 1847 appeared *The Princess, a Medley*; and in 1850 the series of elegies entitled *In Memoriam, A. H.*, a tribute of affection to the memory of Arthur Hallam, a son of the eminent historian, and the chosen friend of the poet in his earlier years at Cambridge. On the death of Wordsworth, in 1850, Tennyson succeeded him as poet-laureate, in which capacity he issued, in 1852, his *Ode on the Death of the Duke of Wellington*. In 1855 appeared *Maud, and other Poems*. The immediate reception of this little volume was not enthusiastic. While many of its lyrics instantly caught


the public ear, *Maud*, as a whole, at first rather puzzled the critics, and was little better than "caviare to the general;" and though it has since risen in estimation, the subtle and recondite art exhibited in the structure of the poem is probably even now appreciated by only a few of its admirers. But for any little falling off in Tennyson's popularity on this occasion, a noble *amende* was made him on his next appearance. *The Idylls of the King*, published in 1859, were everywhere received with enthusiasm. With scarce a whisper of dissent, this work at once took rank as one of the noblest poems in our language. It was followed in 1864 by a volume, containing *Enoch Arden*, one of his most finished and successful works; *Aylmer's Field*; a short piece, *Tithonus*, consummated in its beauty and finish; and a few other poems of a somewhat less elaborate character; one of which, however, *The Northern Farmer*, written in the Lincolnshire dialect, is singularly striking. Since then Tennyson has given us several new *Idylls*, which may be considered to complete his handling of the Arthurian romance: *The Holy Grail* and *Pelleas and Ettarre* (1869); and *Gareth and Lynette*, and *the Tournament* (1872). *The Window, or Songs of the Wrens*, appeared in 1870. In 1875 he essayed in a new field by publishing *Queen Mary*, a drama, which was followed by *Harold*, also a play, in 1876. The collected editions of Tennyson's works (since 1872) arrange the various *Idylls of the King* in the order, not of their publication, but of their proper sequence in the legend of Arthur, and enable the reader to appreciate the full beauty and significance of the ideal story. Tennyson's biography, even more than that of most authors, is given, so far as the public is concerned with it, in the simple enumeration of his works. He has lived for the most part a retired life in the Isle of Wight, not much caring to cultivate society, but greatly beloved by his intimate friends.

It is not an easy matter to criticize the poetry of Tennyson dispassionately, so deeply is one apt to become enamored of its beauties. His verse is the most faultless in our language, both as regards the music of its flow and the art displayed in the choice of words. Nowhere in literature is the *callida junctura verborum* so wondrously seen. As a painter, no modern poet has equaled him. But it is neither to his color nor to his music alone that he owes his great popularity. His *virtue* as a poet doubtless lies in these things; but the pleasure which his poetry gives springs largely from the cordial interest he displays in the life and pursuits of men, in his capacity for apprehending their higher and more beautiful aspirations, and in a certain pervasive purity and strength of spiritual feeling.

TENON, in carpentry, the square end of a timber, reduced about one-third its thickness, to fit the mortise or socket in another timber, so as to join the two.

TENOR, in music, one of the four classes into which voices are divided in respect of their compass. It is the higher description of adult male voice, and generally extends

from  to . Music for tenor voices is most properly written on the

tenor or C clef, , in which its principal tones come within the staff; but the treble clef is occasionally used, with the notes written an octave above their true pitch.

TENOTOMY, or the division of tendons, is a comparatively recent surgical operation, whose object is to relieve some variety of deformity by severing a permanently contracted muscle at its tendinous portion. The invention of subcutaneous tenotomy is due to Stromeyer (1831), and a lucid account of the history of this operation is given by Dr. Little in his *Treatise on Club-foot and Analogous Deformities* (Lond. 1839). The various kinds of knives that have been devised for severing tendons are termed *tenotomes*. The affections in which tenotomy is advantageously employed are club-foot, contractions of the upper extremity from spasm and paralysis, deformity from diseases of the palmar fascia, torticollis or wry-neck, anchylosis of the knee and other articulations, and squinting.—For further details, the reader is referred to the above-mentioned work by Dr. Little, and to the same author's treatise *On the Deformities of the Human Frame* (Lond. 1853).

TENREC, or **TANREC**, *Cenetes*, a genus of mammalia, nearly allied to moles and hedgehogs, usually ranked in the family *erinaceida*. The tenrees are incapable of rolling themselves up like hedgehogs. They are nocturnal animals, natives of Madagascar and the Mascarene isles. Three species are known. They are remarkable for spending the hottest part of the year in a dormant state, as some animals in arctic regions spend the winter. Their flesh has a very peculiar flavor, but is acceptable to the natives of Madagascar.

TENSAS, a parish in n.e. Louisiana, lying on the Mississippi; drained by Tensas river and Macon bayou; 680 sq.m.; pop. '80, 17,824—17,654 of American birth; 16,250 colored. Surface low, level, and fertile; corn, cotton, and sweet potatoes are the staples. Capital, St. Joseph.

TENSE (Fr. *temps*, from Lat. *tempus*, time), in grammar, designates a set of changes which verbs undergo in order to mark the time of the action. See **CONJUGATION**.

TENT (Lat. *tentorium*, from *tentus*, stretched). Without speculating on the relative priority of tents and other forms of human dwellings, it is safe to assume, that among nomadic tribes, some shelter, easily framed and portable, must have been felt to be a primary necessity. The skins of animals, or the larger kinds of foliage, would form the earliest coverings, for which textile fabrics would be substituted as civilization advanced. In the book of Genesis, the patriarchs, Noah, Abraham, Lot, Isaac, Jacob, are represented as dwelling in tents, probably much the same as the modern Arab tents, which are large structures, very rude in form, covering a considerable space of ground, but of small height. Among the Nineveh sculptures is a representation of the tent of king Sennacherib, which, like modern tents, was supported by ropes: numerous tents of the officers and common people are likewise shown.

The early Greek, and afterward the Macedonian tents were small coverings of skins, under each of which two soldiers slept. Alexander the great is said to have had a pavilion of extraordinary magnificence. Its roof, one mass of gilded embroidery, was sustained by eight pillars covered with gold. In the center, was the royal throne; and 100 beds could be made up within the temporary edifice.

The Roman soldiers seem to have used two sorts of tents—one, a tent proper, of canvas or some analogous material, and constructed with two solid upright poles, and a roof-piece between them; the other, more resembling a light hut, of a wooden skeleton, covered by bark, hides, mud, straw, or any material which afforded warmth. Of these tents, the poles of the first would have been too cumbersome for carriage, and were probably cut afresh at each halting-place; the latter was evidently unsuited to removal, and was most likely only erected for winter-quarters, or a long sojourn. The Roman tent held 10 soldiers, with their *decanus*, or corporal.

In Persia, there are many tribes who pass their whole time in tents, which, naturally, they have brought to considerable perfection. They make them nearly hemispherical, with a wooden framework, and covered with felt, while worked hangings close the aperture. This felt admits of the exhibition of much taste in its decoration.

The Chinese lower orders live much in tents. They are ordinarily of matting. These people are clever in their construction, and make them of great size, and with considerable comfort.

Modern military tents are all made of linen or cotton canvas, supported by one or more poles according to shape, and held extended by pegs driven into the ground. British tents comprise the hospital-marquee, a large oblong tent with high side-walls; and the round-tent, or bell-tent, for troops. The latter is 12 ft. 6 in. in diameter, 10 ft. 4 in. high, weighing, with all its appurtenances, 68 lbs., and giving sleeping accommodation to 16 men; the appurtenances comprise 2 mallets, 50 pins, 20 ropes, 20 loops, and 2 long ropes, for use in storms in giving additional firmness round the central pole. In modern tents, there is a low side-wall of canvas, to give greater room inside. These tents are said to be comfortable and moderately healthy, if floored with tarpaulin, vulcanized india-rubber, or other waterproof material. The great drawback is the tendency to blow over. To obviate this, and the inconvenience arising from the conical shape, maj. Rhodes, a British officer, invented some years ago a new tent, which has found much favor both in this and in other countries. He does away with the central pole, and has a circular frame, hinging in the center like the ribs of an umbrella, over which the canvas is stretched. It is claimed for this tent, that it is more roomy than the regulation-tent, in proportion to its weight, is better ventilated, and possesses far greater stability.

TENTACULITES, a genus of obscure annulated tapering shells, found abundantly in some strata of silurian age. They are generally referred to annelids, but the structure of the shell seems to exhibit greater affinities to recent pteropodous mollusks.

TENTERDEN, a municipal borough and market-t., in the Weald of Kent, 18 m. s.s.e. of Maidstone. The church, which contains portions of early English, is surmounted by a massive and lofty perpendicular tower. Tradition asserts that a quantity of stones, which had been got together for the purpose of strengthening the sea-wall of the Goodwin Sands, were employed in the building of this tower, and that when the next storm came, the district of Goodwin Sands, which had formerly belonged to the mainland, was submerged. Thus arose the popular saying, that "Tenterden steeple was the cause of the Goodwin sands." Pop, '71, 3,669.

TENTERDEN, CHARLES ABBOTT, Lord, a distinguished English lawyer, was born at Canterbury, on Oct. 7, 1762. He was the son of a hairdresser. Being admitted on the foundation of the king's school connected with the cathedral, he distinguished himself by perseverance and extreme accuracy. A small exhibition in the gift of the chapter enabled him to proceed to Oxford, where, in 1781, he was elected scholar of Corpus Christi college; and a few years later he obtained what were then the chief distinctions at the university, the chancellor's two gold medals, one being for English, and the other for Latin composition. In due time he became a fellow of his college. After being a student of the Inner Temple in 1795, he was called to the bar. He joined the Oxford circuit; and in spite of a husky voice, a leaden and unmeaning countenance, and painfully timid manners, his great activity of mind, good taste, scholarship, scientific and legal knowledge, were soon appreciated, so that he rapidly acquired a large business. He

published, in 1802, his treatise *On Merchant Ships and Seamen*, in all respects the best written book which had till then appeared on one department of English law. It had the effect of increasing his employment in the more lucrative mercantile causes; and in 1807, it appears from his income-tax return that his fees amounted to upward of £8,000. In 1816 he accepted a puisne judgeship in the court of common pleas; and in 1818 he was knighted, and chosen to succeed lord Ellenborough as chief-justice of the king's bench. As a judge, his most marked characteristic was his evident impartiality and freedom from bias. The comparative leisure he enjoyed on the bench he spent in reading the classics and in the study of botany. He was, in 1827, raised to the peerage. In the house of lords he was the most influential speaker against the Catholic relief bill; and in his last speech he made a vow that if the reform bill, that "appalling bill," passed, he would never again take his seat as a peer. The success of the measure, it is believed, affected his health. He was seized with a violent attack of inflammation in Nov., 1832, when presiding at the trial of the mayor of Bristol for misconduct during the riots, and he died there on the 4th of that month.

TEN THOUSAND, RETREAT OF THE. After the battle of Cunaxa and the death of Cyrus, in the expedition of the latter against his elder brother Artaxerxes, the Greek army being in great straits chose Xenophon as one of their leaders, and by his firmness and prudence were conducted back to Greece after enduring many hardships and fierce warfare. The story is told by Xenophon himself in his *Anabasis, or Retreat of the Ten Thousand*, (see *CYRUS* and *XENOPHON*). The entire distance, going and coming was 1155 parasangs, or over 4,000 English m., and the time occupied in the retreat was 8 months. The course was through Media, across the Carduchi range, through Armenia and across the Euphrates, and then through the countries of the Taochi, Chalybes, Macrones, and Colchians, terminating in the Greek colony of Trapezus, on the Euxine sea.

TENUROS TRÉS, a tribe or sub-order of birds, of the order *insessores*, characterized by a lengthened slender bill, which is sometimes straight, sometimes curved. Some of them feed on insects, some chiefly on the honey of flowers. To this tribe belong the creepers (*certhiada*), sun-birds (*cinnyrida*), humming-birds (*trochilida*), and hoopoes (*upupida*).

TENURE OF LAND, in England, was an accompaniment or immediate consequence of the feudal system (q.v.) established during the middle ages throughout the greater part of Europe. Feuds were introduced by the barbarous tribes who poured themselves into the Roman empire during the 4th, 5th, and 6th centuries. The chief feature of feuds was, that the lands of the conquered country were parceled out to the leaders, on the condition of bearing arms whenever the sovereign required them. The relation thus created between sovereign and vassal was called a feud. The grantee held his lands at first for life only, but gradually it was developed into a hereditary character, and also into one which admitted of subinfeudation, i.e., the parceling out of the feudal land among vassals of the head vassal, who was the lord of his own vassals. This kind of relation between lord and vassal gradually was extended to all kinds of land, for the owners of allodial land voluntarily surrendered their land to some lord, so as to have the same advantages. The vassal did homage to the lord, and took the oath of fealty. Besides these characteristics, the holding came to be attended with the following incidents. 1. An aid, which was a payment granted to help the lord in his necessities. 2. A relief was a tribute paid by a new tenant on succeeding to his predecessor. 3. A fine was paid by a tenant to the lord on alienating the lands to a purchaser. 4. An escheat or forfeiture was the reverting of the estate to the lord when there was a failure of heirs or some violation of duty on the part of the vassal. The feudal system was extended to England by the Norman barons soon after the conquest, with the concurrence of William I., much to the dislike of the Saxons, whose grievances grew until they found vent in Magna Charta, which was in fact an attempt to restore their earlier constitution. The chief fiction, however, of a relation between the crown and the holders of land was not got rid of. The crown was nominally the lord paramount, and there were intermediate lords called mesne lords, of whom the tenants held. Gradually, the kinds of tenure were classed under free and base services—the former being those which a free-man might perform, as serving in war, or paying a sum of money; the latter, such as a peasant might perform, such as ploughing the lord's land, etc. These were afterward further distinguished according to the certainty or uncertainty of the extended service to be performed. Ultimately, the tenures were classed as three. 1. *Knight-service*, or *chivalry*, i.e., holding on condition of serving in the war, and taking the oath of fealty. This was accompanied by the incidents of descent, wardship (or guardianship of the knight's heir by the lord), marriage (i.e., the lord's right to give the knight's infant in marriage), aids, reliefs, primer seisin (i.e., one year's profits from an heir on his succession), fine, escheat, and forfeiture. These incidents gradually grew irksome. James I. proposed to commute knight-service into an annual fee-farm rent; but this not being done, the statute of 12 Ch. II. c. 24 swept the whole away, and converted it into free socage. 2. *Free socage* was a tenure by some certain and determinate service, as by paying a small fixed rent, or ploughing the lord's lands for a fixed number of days. The incidents were rather less burdensome than those of knight-service, being descent, wardship, marriage,

and reliefs, primer seisin, fines, escheat, and forfeiture. These incidents were all abolished by the above statute of 12 Ch. II. c. 24, and the tenure of free socage is now generally known as freehold. 3. *Villeinage service*, or copyhold tenure (q.v.), which still exists nearly in its original state. The result is, that in England at the present day the two tenures are freehold and copyhold. The leading characteristic of freehold is, that practically the feudal relation between the crown and the holder is cut off, and the holder is entirely his own lord and master, can sell the estate, devise it by will, give it away, and do what he likes with it free from any interference or payment to the crown. As to copyhold, the feudal relation is kept up to a certain extent between the lord and the copyhold tenants, who must in form pay rents more or less nominal, and fines and heroids (q.v.) to the lord on alienating the lands or succeeding thereto. Yet, practically, the copyholder does not materially differ from a freeholder except that he is liable to these petty and harassing acknowledgments toward a stranger; and by recent statutes, he can compel the lord of the manor to commute these fines and incidents, and convert the tenure into freehold.

In Ireland the tenure of land is almost identical with that in England.

As to Scotland there is a marked difference between the tenure of lands there and the tenure in England. At the present day the feudal system prevails to a great extent, resembling in many respects the English copyhold tenure. Every piece of land there has generally its lord or superior and its vassal, that is say, the vassal has the *dominium utile*, or actual enjoyment, while the superior has a kind of superior interest, or *dominium directum*, which consists in his drawing a rent called a feuduty, which the vassal is bound to pay, or to forfeit the land. On each alienation or death of the vassal, there must be certain forms superadded, implying a consent or recognition by the superior, and certain casualties or additional payments must be made on such occasions. Recent statutes have tended to extinguish several of these superfluous forms, and make the vassal more independent. But a great many remain unaltered. And not only is there this feudal relation between the crown and its vassals, but these may subdivide the property and create intermediate estates without limit, each vassal being in turn the superior to his subvassal; and this endless chain of relationships complicates the conveyancing still more. See CONVEYANCING; FEU.

TEOCALLI (House of God), the name given to the temples of the aborigines of Mexico, of which many still remain in a more or less perfect state. They were built in the form of four-sided pyramids, and consisted for the most part of two, three, or more stories or terraces, with the temple, properly so called, placed on a platform on the summit. The largest and most celebrated is the pyramid of Cholula, measuring 1440 ft. each way, and 177 in height; it is much defaced, and the temple on its summit has been removed. The teocallis in Yucatan are in far better preservation; they are not generally built in terraces, but rise at an angle of 45° to the level of the platform, with an unbroken series of steps from base to summit. The temples on their summit are sometimes ornamented with bas-reliefs in stucco and hieroglyphic tablets, and the roof is formed by courses of stone approaching each other, and furnished with projections like dormer windows. Not unlike the teocallis are the palaces of the Aztec kings or chiefs, which differ from them in having the pyramid smaller, less prominent, and oblong in plan, while the building, larger and more elaborate, consists for the most part of a stone basement, with square doorways, but without windows, surmounted by a structure which appears to be directly copied from wood-work. On some of these façades we have also rude pillars and grotesque carvings, and there are often a number of chambers in the interior. A palace and temple are sometimes found attached together; and in a few cases, the most remarkable of which is the Casa de las Monjas, at Uxmal, the buildings are arranged round a court-yard. See MEXICO.

TE'OS, an ancient Ionian city on the w. coast of Asia Minor; on a peninsula s.w. of Smyrna. It was a member of the Ionian confederacy and prosperous till the Persian conquest, when a large part of its inhabitants withdrew to Abdera in Thrace. Its principal production was wine. It was the birthplace of Anacreon, of Iteatæus, of the geographer Andron, and the sophist Protagoras.

TEPIC, a t. of Mexico, in the state of Jalisco, on a height 400 m. n.w. of the city of Mexico. Tepic is the residence, during the rainy season, of most of the wealthy inhabitants of the port of San Blas, about 25 m. distant. Pop. 10,000.

TERA MO (anc. *Interamna*), a t. of southern Italy, in the province of the same name, at the junction of the Tordina and Vezzola, 28 m. n.e. of Aquila. It is well built, with long and rather wide streets, has a cathedral, a public library, a foundling-hospital, and a botanic garden, carries on an active trade in corn, wine, and olives, and has a pop. of 10,000.

Ancient *Interamna* (of which the name Teramo is an Italianized form) was a city of Picenum, in the territory of the Præutii. In the middle ages it also bore the name of Abruntium or Apruntium (supposed to be a corruption of Præutii), whence the modern name of the district, Abruzzo. Vestiges of the ancient city—the amphitheater, temples, baths, aqueducts, etc.—are traceable, and many statues, altars, and inscriptions have also been discovered. In the plain below Teramo took place, July 27, 1460, between the army of John duke of Anjou and the Milanese allies of Ferdinand I. of Aragon,

one of the most sanguinary battles ever fought in Italy. After the contest at Castelfidardo (1860), Teramo was the first Neapolitan city that opened its gates and gave joyful welcome to king Victor Emmanuel.—Pop. of province '71, 246,004.

TERAPHIM (Heb. plur.), a word of uncertain derivation (connected by some with *Serapis*), denoting certain images, idols, or household gods occurring in the Old Testament, which were consulted as oracles, and probably even worshiped to a certain extent. The gods which Rachel stole are called *teraphim*, and Saul was reproached by Samuel for stubbornness which is like *teraphim*; his daughter placed a *teraph* into David's bed to conceal his flight, etc. There is no proof that this veneration for *teraphim* was not held perfectly compatible with the worship of Jehovah, spite of some reformatory attempts to sweep them away. Many and curious have been the explanations given of the nature of the *teraphim* by different scholars in and out of the synagogue. A vague but generally prevailing notion is that of their having been a kind of astrological automata, which somehow or other could be made to move and to utter certain sounds. All that is certain, however, is only the fact that the real meaning and character of this strange idol had been forgotten already at a very early period.

TERATOLOGY (Gr. *terata*, wonders, or monsters) is a term used in physiology as synonymous with "The History of Monstrosities or Anomalous Formations." See *MONSTROSITY*.

TERBIUM, a very rare metal, whose oxide, *terbia*, is found in association with the rare earth yttria, the oxide of yttrium (q.v.).

TERBURGH, GERHARD, a Dutch painter, belonging to an old and respectable family of Zwoll, was b. in 1608; studied first under his father, who was also an artist of note, and afterward visited Germany, Italy, Spain, England, and France. On his return to his native country he settled at Deventer, of which town he became burgomaster, and died in 1681. The elegant ostentatious life of his time, with its superlative courtly manners and splendid costume, found in Terburgh an admirable painter. The central figure in many of his pictures is a young lady with fair hair and dressed in white satin. His most famous piece, however, is a picture containing portraits of the 69 plenipotentiaries who drew up the treaty of Westphalia. In Dr. Waagen's opinion, Terburgh is the real founder of the art of painting conversation-pieces, and at the same time the most eminent master in this style. "In delicacy of execution he is inferior to none, and in a certain tender fusing of the colors he excels all others; but none can be compared with him in the enchanting harmony and silvery tone, and the observance of the aerial perspective. His figures, which are well drawn, have an uncommon ease of refinement, and are frequently very graceful." Terburgh's works are to be found in various English collections, particularly those of sir Robert Peel, the duke of Sutherland, lord Ashburton, Mr. Hope, the marquis of Bute, and her majesty; as also in the galleries of Dresden, Munich, Vienna, the Louvre, Amsterdam, and Berlin.

TERCE (Lat. *tertia*, i.e., *hora*, the third hour), one of the "lesser hours" of the Roman breviary, so called from the time of the day for which it is fixed. See *CANONICAL HOURS*.

TERCE, in the law of Scotland, is the interest or estate which a widow has in the land of her deceased husband at common law. This amounts to a life rent of one-third of such estates. In estimating the estate of the husband all real burdens must be first deducted, and certain other things—as the mansion-house, if there is only one, superiorities and patronage, leases and feu-duties. The mode by which a widow completes her title to the *terce* is by a process called *kenning to the terce* (q.v.), the object of which is to separate her portion from the rest, which goes to the heir, so that each may possess independently his and her portion respectively. She is then in the position of an ordinary proprietor for life. Though *terce* is a legal right, yet this right of the widow may be modified by an ante-nuptial contract, under which she is otherwise provided for.—In England and Ireland a widow has a similar right, called *dower* (q.v.).

TERCEI RA, one of the Azores islands (q.v.), and the second in size of that group, forms one of the central cluster, and lies eastward from San Jorge. Area, 220 sq.m.; pop. between 40,000 and 50,000. Steep rocks of lava almost everywhere line the coast—the island is accessible only at few places, and these are defended against invasion by fortifications. The soil is fertile; the plateaux of the mountains afford excellent pastures, and cattle breeding is an important branch of industry; the principal articles of export are wine, timber, and orchil. Chief town of the island, Angra, the capital (pop. 18,000), in the fort of which reside the governor and the bishop of the Azores.

TEREBINTA'CEÆ. See *ANACARDIACEÆ*.

TEREBRANTIA, a section of the insect order *hymenoptera*, distinguished by the females having an ovipositor. To this section belong sawflies (*tenuredinida*), ichneumons, gall-insects, etc.

TEREBRATULA, a genus of deep-sea brachiopodous mollusca. The animal is attached to the shell by a pedicel, and the brachial disk is three-lobed, the center lobe being elongated and spirally convoluted. The shell is smooth, with a truncated perforated beak, the foramen being circular. The shelly loop is very short and simple.

The shell of this genus, and some of its allies, is covered with minute quincuncial perforations, sometimes visible to the naked eye, but usually requiring a lens of a low power to distinguish them. The generic title is now restricted to shells with a short internal loop. The species with long loops are grouped together under the name *Wuldhemia*. Of the restricted genus, there is only a single living species (*terebratulă vitrea*); but the fossil species are more than a hundred in number, and are found in all periods of the earth's history, from the Devonian age upward.

TEREDO, a genus of lamellibranchiate mollusks of the family *pholadidæ*; very much elongated, and worm-shaped; the mouth very delicate, open in front and at its lower part, for the passage of the short foot; the shell rather thick, equivalve, destitute of hinge, gaping at both ends. The species are rather numerous, and are generally known by the name of **SHIPWORM** or **PILEWORM**, because they perforate and live in timber. Their perforations are made in the direction of the grain of the timber, except when a knot is met with or the shell of another *teredo*, when they accommodate themselves to circumstances by bending. The cavity is lined with a calcareous incrustation. The aperture by which the teredo enters is small, and it grows within the cavity which it makes. Two small valves form the true bivalve shell; the calcareous tube incloses the worm-shaped body of the animal. Its growth is very rapid, and its ravages are often terrible. A piece of deal has been found riddled by shipworms after forty days' immersion. Ships, piles, and all submarine woodwork are destroyed by it. Copper-sheathing is employed to protect ships from the shipworm, or the timber is driven full of short, broad-headed nails, the rusting of which forms a coating which it does not penetrate. The dykes of Holland have been threatened with destruction by its ravages. The Common **SHIPWORM** (*teredo navalis*) is said to have been introduced into Europe from warmer climates. It is now, however, extremely abundant in European seas. In the East Indies, a very large species (*teredo gigantea*) is found, generally in shallow water among mangrove trees; it is sometimes more than five feet in length, and at the thickest part three inches in diameter.

TEREK, one of the most considerable streams of the Caucasus, rises near the lofty mount Kasbee (about 17,000 ft. high), flows n.w. through the defiles of the mountains, crossing the district of the Kabarda, and reaches the border of the government of Stavropol, where it curves eastward, forming the s. boundary of that government, until, reaching Kisliar, it divides into numerous branches, which form a delta 70 miles broad, and 50 miles long from apex to base, and falls into the Caspian sea. It is not navigable. Total length estimated at from 300 to 390 miles.

TERENTIUS AFER, **PUBLIUS**, the comic poet, was born at Carthage, 195 B.C. By birth or purchase, he became the slave of the Roman senator Publius Terentius Lucanus, who, out of regard to his handsome person and unusual talents, educated him highly, and finally manumitted him. On his manumission, he assumed, of course, his patron's *nomen*, Terentius. His first play was the *Andria*, written in his 27th year, but not acted till 166 B.C. Its success was immediate, and introduced its author to the most refined society of Rome, where his engaging address and accomplishments made him a particular favorite. His chief patrons were Lælius and the younger Scipio, after living with whom in great intimacy for some years in Rome, he went to Greece, where he translated 108 of Menander's comedies. He never returned; and the accounts of how he came by his death are conflicting. He is supposed to have died in his 36th or 37th year, leaving one daughter. Six comedies are extant under the name of Terentius, which are, perhaps, all he produced—viz., *Andria*, *Hecyra*, *Heautontimorumenos*, *Eunuchus*, *Phormio*, and *Adelphi*. In conjunction with Plautus, Terentius, on the revival of letters, was studied as a model by the most accomplished play-writers. His language is pure almost to being immaculate, and though inferior to Plautus in comic power, he is more than his match in consistency of plot and character, in tenderness, in wit, and in metrical skill. His plays have an educational value, as dividing, with the works of Cicero and Cæsar, the honor of being written in the purest Latin. They have been translated into most of the European languages. The best editions of his works are those of Bentley (Cambridge, 1726), and of Parry (1857).

TERESA. SAINT, one of the most remarkable of the female saints of the modern Roman calendar, and the most admired of the modern mystic writers of that communion, born at Avila, in Old Castile, March 28, 1515, was the daughter of Alfonso, of the noble house of Sanchez de Ceyeda. Even as a child, Teresa was remarkable for piety of a most enthusiastic kind; and when she was but seven years old, she and her little brother, Rodrigo, fled from her father's house, with the design of offering themselves for the crown of martyrdom among the Moors, but were overtaken and restored to their parents. Her mother died while she was still young, and she was educated in a convent at Avila, from which, however, she was compelled by illness to return home when she was in her 16th year. During her illness, she resolved, notwithstanding the very earnest opposition of her father, to become a nun, and having in her 18th year entered a convent of the Carmelite order in her native city, she made her solemn vow on the 3d of November, 1534. In this convent she continued to reside for nearly thirty years, but it was not until about the year 1539 that her constitution became strong enough to permit her to follow, even in an imperfect way, the observances of conventual life. Her own

account of her mental and spiritual condition during this period, which extended to the year 1555, is extremely interesting, and, like the confession of St. Augustine, and other saints, has furnished endless materials to the spiritualists of more recent times. The change of heart and of purpose came in 1555-1556, and was as complete and decisive as her former condition had been purposeless or fluctuating. After a time her religious exercises reached a most extraordinary degree of asceticism. Her prayers were almost continual, and she was reported to be favored with visions, ecstasies, and other supernatural visitations, of which many curious details are related by her biographers, and in her own letters and papers. The fame of her sanctity spread not only throughout Spain, but into almost every part of the church. By some, the reality of the reported supernatural favors which were ascribed to her were called into question; and there were even some who threatened to invoke the rigorous investigation of the holy office; but the popular voice was freely accorded to her, and the authority of St. Francis Borgia, St. Peter of Alcantara, and other high names eventually disarmed the opposition. The most notable and permanent fruit of the enthusiastic spirituality of Teresa is the reform of the Carmelite order, of which she became the instrument. She commenced this work in concert with a few zealous members of her own sisterhood in the convent at Avila, where she had resided from the date of her profession; but after a time, she obtained permission from the holy see, under the direction of Peter of Alcantara, to remove with her little community to St. Joseph's, a small and very humble convent in the same city, where she established in its full rigor the ancient Carmelite rule, as approved by Innocent IV. in 1247, with some additional observances introduced by Teresa herself. This new convent was established in 1562, and in the end of that year, or the beginning of 1563, Teresa took up her abode therein; and in 1565 she obtained from pope Pius IV., a formal approval for the rule as modified by her. For two years Teresa lived in great privacy and quiet in her convent of St. Joseph; but in 1567, the general of the Carmelite order, F. Rubeo, was so struck, during his visitation of the convents at Avila, with the condition of that over which Teresa presided, that he urged upon her the duty of extending throughout the order the reforms thus successfully initiated. Teresa entered upon the work with great energy, and although she met with much opposition, nevertheless succeeded in carrying out her reforms. In 1579, the Carmelites of the stricter observance established by Teresa were released from the jurisdiction of the old superiors, and united into a distinct association, with a separate head and a distinct organization, which was approved in 1580 by pope Gregory XIII. Under this new constitution, the association flourished and extended; and within the lifetime of Teresa, no fewer than 17 convents of women and 16 of men accepted the reforms which she had originated. Teresa died at Alba, October 4, 1582, in her 68th year. She was canonized by Gregory XV. in 1621, her feast being fixed on the 15th of October. She left a number of works, which have at all times maintained a high reputation among the spiritualists of her own church, and whose merits, in many respects, are acknowledged by non-Catholic writers. They consist of ascetical and mystical treatises, instructions in the conventual life, meditations, etc., besides a large number of letters, which possess remarkable literary merit, quite independent of their doctrinal character. Her works in the original Spanish fill two folio volumes, and they have been in the whole or in part translated into almost every European language. Her life occupies nearly an entire volume of the new continuation of the *Acta Sanctorum*; and several more popular biographies have been written in Spanish, French, Italian, German—the best-known English one being that by the rev. Canon Dalton. See *Leben der heil. Theresia* von Dr. Fr. Pöhl (Regensburg, 1847).

TERHUNE, MARY VIRGINIA (HAWES), b. N. Y., 1835; married, 1856, the rev. Dr. Edward P. Terhune, now pastor of the First church (Congregational), Springfield, Mass.; contributed at the age of sixteen to *Godey's Lady's Book* a sketch entitled *Marrying from Prudential Motives*, which was copied into an English paper, thence transferred to a French journal, retranslated into English, and published in England and America as an English story. Her publications are: *Alone; The Hidden Path; Moss Side; Husbands and Homes; Miriam; Nemesis; Sunnybank; Husks; The Christmas Holly; Ruby's Husband; Phemie's Temptation; Helen Gardner; The Empty Heart; Common Sense in the Household*, a book of domestic recipes; *Loiterings in Pleasant Paths*.

TERLIZZI, a flourishing, well-built town of Italy, in the province of Bari, 20 m. s.e. of Barletta, and 8 m. from the Adriatic. It contains a cathedral, a parish church, and three convents. The almond tree is extensively cultivated in the vicinity. Pop. about 19,000.

TERM, in legal phrase, has several meanings, but that best known is when it denotes certain days of the year for calculating rent between landlord and tenant, and which have been adopted by immemorial usage, owing to the convenience of thus terminating the contract between the parties. In England and Ireland the year is for this purpose divided into four quarters or terms. These are—Lady-day, Mar. 25; Midsummer-day, June 24; Michaelmas-day, Sept. 25; and Christmas-day, Dec. 25. In Scotland, the terms as between landlord and tenant are divided into legal and conventional terms. There are two terms recognized by common law, viz., Whitsunday, May 15, and Martinmas, Nov. 11; while other two conventional terms subdivide these, viz.,

Candlemas, Feb. 2; and Lammas, Aug. 1.—There is also a subdivision of the year into law-terms (q. v.), adopted and sanctioned by statute for the purpose of the sittings of the law-courts. These are Hilary, Easter, Trinity, and Michaelmas terms.—There is a third and technical meaning of the word “term,” when it means an estate for years in land.

TERMINI (anc. *Thermæ Himærensēs*), a sea-port town on the n. coast of Sicily, 21 m. e. s. e. of Palermo, at the mouth of the river Termini. It is built partly on a plateau (the summit of which is crowned by a castle—now a prison—of mediæval construction), and partly on the slope and in the hollow beneath. Termini, with its noble background of towering hills, and its magnificent view of the Mediterranean, well deserves the title of *La Splendidissima*, bestowed on it by the emperor Frederick II. Many of the inhabitants are engaged in fishing for tunny and anchovies. Pop. about 20,000.

The ancient *Thermæ* (of which Termini is an Italian corruption) was founded 408 B. C., after the destruction of the Greek city of Himæra, and whence its name Himærensēs, whether it owed its origin to the Carthaginians themselves, or to the surviving citizens of Himæra, is doubtful; but it soon passed under the authority of the former, who here defeated the Romans with heavy loss (260 B. C.) during the first Punic war. After Sicily became a Roman province, *Thermæ* was treated with peculiar consideration by its new masters, and became a flourishing place. Relics of the ancient city, as the baths (which are still used), fragments of a theater and aqueduct, are still visible; and numerous inscriptions, statues, etc., are preserved in public and private collections.—See B. Romano's *Antichità Termitane* (Palermo, 1838).

TERMINUS, a Roman divinity, supposed to preside over public and private boundaries. Originally he appears to have been the same as Jupiter himself, but gradually he was recognized as a separate and distinct god. Hardly any religious conception is more thoroughly characteristic of the Romans, that land-loving, law-reverencing people, than the conception of Terminus, whose worship was practiced down to a late period.

TERMITE, or **WHITE ANT**, *Termites*, a genus of insects of the order *neuroptera*, and and of the family *termitidæ* or *termitinæ*. They live in great communities, chiefly in tropical countries, and are almost omnivorous, in the larva, and pupa, as well as in the perfect state. In their communities there are five classes—males, females, workers, neuters, and soldiers. The workers, neuters, and soldiers seem all to be imperfectly developed females. The males and perfect females have four wings, which are long and nearly equal, and which are often suddenly cast off before the termination of their life; but the greater part of the community consists of workers, which are wingless. The “soldiers” are larger than the neuters, and have very large mandibles, which they are always ready to use upon any assault. The antennæ of the genus *termes* are long and thread-shaped, with about 20 joints; the eyes are small and prominent, and there are three *ocelli*; the abdomen has a pair of minute caudal appendages. Most of the white ants make their nests on the ground, but some of them among branches of trees, decayed or dry wood forming a principal article of their food. The species which make their nests on the ground make them conical, or turret-shaped, often 12 ft. and sometimes even 30 ft. high, in groups, like a little village. The soil where the white ants have labored is particularly good, and the south Africans take advantage of its excellent quality. The nest is divided internally into numerous chambers and galleries; there are generally two or three roofs within the dome-shaped interior, and the thick walls are perforated by passages leading to the nurseries and magazines of food. If a breach is made in the building, the soldiers appear, ready for defense. White ants are very useful in consuming every kind of decaying animal or vegetable matter. They even eat grass, and the snapping of multitudinous mandibles has been likened to the sound of a gentle wind among trees. They sometimes attack the wood-work of houses, and soon reduce the thickest timbers to a mere shell. Extraordinary and incredible stories are told of their attacking and devouring large animals, but it seems probable that they do so only when the animals are helpless from age or sickness. They come in vast hosts to any place where food is to be found, and are not easily driven off; multitudes pressing on, although previous multitudes have been destroyed. They gather great stores of corn into their nests, of which the natives of Africa often avail themselves. They are themselves also used as food in Africa, and are said to be delicate and pleasant. The abdomen of the pregnant female termite becomes dilated to an extraordinary degree, so as to exceed the rest of her body 1500 or 2,000 times, and she is then about 1000 times heavier than the male insect. Her fecundity is prodigious; she is supposed to lay more than 31,000,000 of eggs in a year.

The termites which live in trees construct nests of great size, like sugar-casks, of particles of gnawed wood, cemented by a kind of gluten, and so strongly attached to the branches as not to be shaken down even by violent storms. These species sometimes take up their abode in the roofs of houses, where they are very destructive to the wood-work.

T. mordax and *T. atrox* are among the African ground-building species. *T. lucifugus* is found in the s. of Europe, and has proved very destructive in the navy-yard of Rochefort, and elsewhere in the s. of France. Sulphurous gases and chlorine are forced into its galleries, without effecting its extirpation. *T. flavicollis* is very injurious to olive trees in Spain. *T. frontalis* extends as far n. in the United States as Massachu-

setts, and does mischief in vineyards, not only attacking dead wood, but the roots of living vines. No true species of *termes* is found in Britain, but some of the *termidæ* are British insects. One of them is *psorus pulsatorius*, one of the insects which emit a sound like the ticking of a watch in houses. The species of the genus *psorus* are very small, active insects, living beneath the bark of trees, in wood, straw, etc. Some of them are found among books and in collections of natural history.

In books of travels, the termites are often called ants, their habits being similar, although they belong to a different order of insects.

TERN (*Sterna*), a genus of birds of the gull family (*laridæ*), by some made the type of a distinct family (*sternidæ*); having the bill as long as the head, or longer, nearly straight, compressed, slender, tapering; the wings long and pointed; the tail long and forked. The plumage is very full. From their forked tail, manner of flight, and small size, the terns are often called sea-swallows. They are incessantly on the wing, skimming the surface of the water, and catching small fishes and other small animals from it. The species are numerous, and are found in almost all parts of the world. Some of them are of very wide geographic distribution. Many are birds of passage. Thus, all which occur on the British coasts, and in other northern parts of the world, are mere summer visitors. The COMMON TERN (*S. hirundo*) is abundant on the more southern shores of Britain, but rarer in the north. It is found also on the coasts of Europe, Asia, and Africa, from the Arctic circle to the furthest s.; but there is some doubt if its range extends to America, where a very similar species, WILSON'S T. (*S. Wilsoni*), was long mistaken for it.

TERNANT, JEAN DE, Chevalier, 1740-1816, b. France; was with the French army in America during the revolutionary war. Baron Steuben made him one of his inspectors in 1778. He was afterward lieutenant-col. and inspector of troops in the south, was captured at the surrender of Charleston in 1780. After his exchange he returned to his former position in the south. He was a col. in the French army during the French revolution, and minister to the United States, 1790-93.

TERNATE. See MOLUCCAS.

TERNAUX, GUILLAUME LOUIS, Baron, 1763-1833, b. Sedan, France. When but a boy he became manager of his father's woolen mill, and by his business sagacity rescued its finances from ruin. He was a deputy to the assembly, 1818-23 and 1827-30. The revolution of 1830 was brought about by the position taken by Ternaux and his party, and by it he lost a large fortune. He introduced improvements in manufactures and wrote several treatises on financial and industrial subjects. His nephew, HENRI TERNAUX-COMPANS, 1810-64, was noted as a collector of old books, his library of works bearing on the discovery and conquest of America being the finest in existence. He published a *Bibliothèque Américaine*, 1493-1700 (1837).

TERNAY, CHARLES LOUIS D'ARSAC DE, 1722-80, b. France; entered the French navy in 1738. In 1762 in command of a squadron he attacked Newfoundland, and captured St. John's, and several British vessels. He was governor of the island of Bourbon, 1772-79. The next year he commanded the French fleet bringing over to America count Rochambeau and his forces. He died at Newport soon after his arrival.

TERNI (anc. *Interamna*) a t. of central Italy, on the right bank of the Nera (anc. *Nar*), a little below its confluence with the Velino, 49 m. n.e. of Rome. It is encircled by a wall, with towers and five gates, is well-built, gives name to an archbishopric, and possesses a cathedral, several fine palaces and churches, a hospital, theater, and various monuments of antiquity, as the ruins of an amphitheater, temples, and baths—none of which, however, are of much importance. Terni manufactures silk and woolen fabrics. Pop. about 14,000. About 2 m. from the town is the famous cataract of Velino, 500 ft. high, celebrated by Byron in his *Child Harold*.

Ancient *Interamna*, according to classic tradition, was founded only 80 years after Rome, but we have no knowledge of its history until it ceased to be an Umbrian, and became a Roman city. About the time of Marius and Sulla, it was (according to Florus) one of the *florētissima Italici municipia*, but at no period did it occupy a very prominent position. Its chief claim to notice arises from its being regarded (by some) as the birthplace of the historian Tacitus, and of his descendant, the emperor of the same name.

TERNSTROEMIA'CEÆ, a natural order of exogenous plants, allied to *guttiferæ*, and consisting of trees and shrubs, natives of warm and temperate countries. About 150 species are known. They are most abundant in South America; a few are found in North America; some in India, China, and other parts of the east; only one African species is known; and Europe produces none. The leaves are alternate, leathery, in many species evergreen, generally undivided, sometimes dotted. The flowers are on axillary or terminal stalks, generally white, sometimes pink or red; with 5 to 7 concave, leathery, deciduous sepals, and 5 to 9 petals, which are often combined at the base; many hypogynous stamens, which are either free or variously combined: 2 to 7 filiform styles, more or less combined; the fruit a 2 to 7-celled capsule, either opening by valves, or leathery and indehiscent, the seeds large, few, and attached to the axis, the cotyledons very large, and often containing much oil. This order is very important as containing the tea-

shrubs. It is also interesting because of the great beauty both of the foliage and flowers of many of the species, of which the genus *camellia* affords the best-known examples. See TEA, CAMELLIA, and GORDONIA.

TERPAN'DER, a Greek musician who flourished in the beginning of the 7th c. B.C. He was born at Antissa in the island of Lesbos; went to Sparta, and in 676 was crowned victor in the first musical contest at the feast of Apollo Carneius. He established there the first musical school in Greece. He enlarged the compass of the lyre to an octave, and was the first who regularly set poetry to music.

TERPSICHORÉ (Gr. delighting in the dance), one of the nine muses (q.v.), presided over choral song and dancing.

TERRACINA (anc. *Tarracina*), a t. of central Italy, in what was formerly the Papal States, is situated on the coast at the s.e. extremity of the Pontine Marshes, near the mouths of the Ufente and Amaseno. It is the seat of a bishop, possesses a cathedral (built on the ruins of a heathen temple), a square with a handsome fountain, a palace of Pius VI., and on the summit of a precipice overlooking the town, the ruins of a palace of Theodoric, king of the Goths. The harbor, a naval station of the Romans, is now filled up. Pop. 7,600.

Tarracina was originally a Volscian town, and was called by the Volscians *Anxur*, a name which is often applied to it by the Latin poets. It fell into the hands of the Romans, 400 B.C., became the seat of a Roman colony, 329 B.C., and as long as therepublic and empire lasted was a flourishing and important city. So closely do the mountains here approach the sea that there was scarcely room for the celebrated "Appian way;" hence the importance of Tarracina as a military position. Numerous ruins of the ancient town are extant.

TERRA or TELUS, in classical mythology, one of the oldest of divinities, the earth-goddess, wife of Uranus, mother of Oceanus, the Cyclops, the Titans, the giants, Themis, Mnemosyne, etc. Her festival was on April 15, and sacrifices were offered to her in spring and autumn. She corresponds to the Greek Ge, called by Hesiod the first-born of Chaos.

TERRA COT'TA, an Italian term signifying *baked clay*. It is applied chiefly, if not altogether, to manufactures of brick-earth used for ornamental purposes, especially those used architecturally. Formerly it was not uncommon in Britain, particularly about the beginning of the 18th c.; but after the reign of queen Anne it was discontinued, and was scarcely ever used until within the last ten years. A complete revival has now taken place, and this material has been applied with admirable effect in some of the buildings lately erected, especially the South Kensington museum, and the Charing Cross railway station hotel.

TERRA DEL FUEGO (Land of Fire), an archipelago situated at the extreme s. of South America, from the main land of which it is separated by Magellan's strait, consists of 11 large islands, of which the chief is King Charles's South Land, and about 20 islets; lat. 52° to 56° s., long. 65° to 75° west. The area of King Charles's South Land, which forms more than three-fourths of the entire area, is about 21,260 sq. miles. This island, like the other islands of the archipelago and the coast of the main-land, is much broken on the west side by gulfs and inlets. The eastern coasts are, as a rule, level and wooded; while the western coasts are generally rocky and mountainous. The general aspect of the group is wild and desolate in the extreme. Some localities, however, are of quite a different character. The coast-scenery of Picton island resembles that of the s.w. coast of England. The s. part of the island is chiefly in moor and down; the n. part is covered with thick forests. The scenery is fine, and there are fine fresh-water lakes, frequented by abundance of water-fowl. Many of the mountains are volcanic—from which circumstance this region has derived its name—and lava and volcanic productions are seen everywhere. The highest mountains rise to from 6,000 to 7,000 feet, and are covered with snow. The climate is raw and cold, violent rains and snow-storms occurring in every season of the year. In this region the waters of the Atlantic and Pacific meet and struggle together, and terrific tempests are frequent. The flora of the region comprises some plants found in Great Britain. Wild celery and spoonwort are the only edible plants; but by far the most important articles of food are shell-fish, which abound on the coasts, and a globular fungus, which grows in clusters round the trunk of the antarctic beech—an elegant evergreen, and the prevailing tree in the archipelago. The inhabitants, the number of whom is estimated at 2,000, are generally described as a short, ugly, beardless race, with long black hair, of a rusty iron color, and occupying the lowest rank in the scale of civilization. Capt. W. Parker Snow, who visited Terra del Fuego in 1855, reports somewhat differently of the inhabitants. According to him the natives are robust-looking, powerful, and of the middle height, being on an average over 5 ft. 3 in. in height. The only quadruped among them is the dog. When driven to extremities they first eat their dogs, and then kill and eat the old women of their tribe. More than one attempt has been made to convert these savages to Christianity, but hitherto such attempts have proved abortive. In 1850 a mission-party of seven men, under capt. Allen Gardiner, the projector of the expedition, arrived at Terra del Fuego. The missionaries were not well received by the natives, and the narrative of their residence on these

coasts is simply a record of miserable disasters. Owing to the grossest mismanagement on the part of the home authorities, the wants of the mission-party were neglected, and they found themselves in a short time destitute of provisions. The relief that had been promised never came; and in the autumn of 1851 the whole party, after undergoing horrible sufferings, died of starvation. In the autumn of 1854 another missionary expedition set sail from Bristol for Terra del Fuego, under command of capt. W. Parker Snow; but after many endeavors the attempt to form a mission-station on Terra del Fuego was abandoned.

TERRA DI LAVO RO (*Campania Felix*), now CASERTA, a maritime province of s. Italy, bounded on the n.w. by what was formerly the Papal states. Area, 2,326 sq.m.; pop. '71, 697,403. This is the famous *Campania Felix* of the ancients. Pliny extols its beauty and its fine situation. Florus calls it the finest country in the world. In ancient times it was inhabited by the Ausonii, the Osci, and later by the Campani. The finest part of Campania has been separated from it, and is that fertile tract of country which surrounds the gulf of Naples like an amphitheater; another part has been added to the province of Molise. Terra di Lavoro is watered by two rivers, the Liris, or Garigliano, and the Volturno. Toward the e. it is broken up by the Apennines, and its beautiful ranges of hills are clothed with vine and olive yards, and studded with country-seats. It produces corn, strong wines, oil, fruits, and silk. Its sea-port towns are populous and busy, although here and there the sea-board is interrupted by marshes. The climate is very mild in winter, and extremely hot in summer.

TERRA DI SIENNA. See BURNT SIENNA.

TERRA FIRMA, a term frequently employed to denote continental land as distinguished from islands. But it was at one time more specially applied—1st, to all the main-land of Italy which acknowledged the supremacy of Venice—viz., to the duchy of Venice, Venetian Lombardy, the march of Treviso, the duchy of Friula and Istria; 2d, to that extensive tract of South America bounded by the Pacific ocean, Peru, the silvas of the Amazon, the Atlantic ocean, and the isthmus of Panama, which mostly belonged to the Spaniards during the last century. In a still more restricted sense, the term was applied by the Spaniards to the isthmus of Panama itself. Colloquially, the phrase *terra firma* is applied (but erroneously) to land as distinguished from water.

TERRA JAPONICA. See CATECHU.

TERRANOVA, a sea-port town on the s. coast of Sicily, province of Caltanissetta, on the right bank of the Omonimo, 18 m. e. from Alicata. Pop. 14,974. There is no regular port, but the town carries on a good trade in fruit, corn, pulse, sulphur, soda, and, above all, in cotton, large quantities of which are grown in the vicinity. A kind of coarse cloth is manufactured for home consumption. Terranova is believed to occupy the site of the ancient Gela (q.v.). The town now standing was built by Frederick II. in the 12th century. In its neighborhood is the village of Mazarino, from which the famous cardinal took his name.

TERRAPIN, the popular name of many species of fresh-water tortoises, of the family *emydæ* (see EMTS), natives of tropical and the warmer temperate countries. The neck can be wholly retracted within the shell; the head is flat, and the jaws prolonged into a beak. They feed partly on vegetable food, but also devour fish, reptiles, and other aquatic animals. They swim very well, and even on land move with much greater swiftness than land-tortoises. Their flesh is generally much esteemed.—Several species are natives of North America.

TERRE BONNE, a parish in s.e. Louisiana; bounded on the s. by the gulf of Mexico, on the w. by Atchafakya bayou, drained by Black, Caillon, Chene, and Terre Bonne bayous; traversed by the Louisiana and Texas railroad; about 1,800 sq.m.; pop. '80, 17,956—9,343 colored. The surface is level and heavily timbered. There are many small lakes. The soil is good. The principal productions are corn, molasses, and sugar. Co. seat, Houma.

TERREBONNE, a co. in s.w. Quebec, lying n.w. of the isle of Jesus, having the St. Lawrence river for its s. boundary; 545 sq.m.; pop. '71, 19,591. It is drained by the river Jesus, called the n. branch of the Ottawa. It has saw, grist, and woolen mills. Co. seat, St. Jerome.

TERRE HAUTE, a city of Indiana, U. S., on the e. bank of the river Wabash, 78 m. w.s.w. of Indianapolis; a handsome town, regularly built, on an elevated plateau, in a rich agricultural country, with three railways, the Wabash and Erie canal, machine-shops, and manufactories. It has 3 banks, 4 public school edifices, Roman Catholic convent and schools, free college, 13 churches, 3 daily and 3 weekly papers, 2 public libraries, and abundant supplies of bituminous coal. Pop. '70, 16,103.

TERRE HAUTE (*ante*), a city in s.w. Indiana; incorporated, 1853; co. seat of Vigo co., on fort Harrison Prairie; pop. '80, 16,103. It is the junction of the Terre Haute and Indianapolis railroad, the Evansville and Terre Haute, the Illinois Midland, the St. Louis, Vandalia, and Terre Haute, the Logansport and Terre Haute, the Chicago, Indianapolis, and St. Louis railroads, etc. The National road here crosses the river by a bridge. There are many elegant private residences; and the state normal school, the

Providence hospital and a polytechnic institute. It is lighted with gas and supplied with water. It has a market-house, city hall, a court-house, 6 weekly newspapers, 1 tri-weekly, and 3 dailies. The Wabash is navigable in the spring, and steamboats ply to points on the Ohio and Mississippi rivers. Its manufactures include blast furnaces, glass and iron works, machine shops, and nail factories.

TERRELL, a co. in s.w. Georgia, drained by the Flint river and its creeks; traversed by the South-western railroad; about 300 sq.m.; pop. '80, 10,451—10,435 of American birth; 6,184 colored. The surface is level and moderately fertile. Co. seat, Dawson.

TERRE-PLEIN, in fortification, is the flat surface of the rampart, on the front portion of which the parapet and banquette are formed, and of which the rear slopes down to the general level of the inclosure.

TERRESTRIAL MAGNETISM. In the article **MAGNETISM**, it is shown that the earth itself is to be considered as a great magnet; and in the present article it is proposed to exhibit the chief results of observation on the earth's magnetism as seen in its action on artificial magnets. That action is simply *directive*; that is, it determines the way in which the magnet shall point, but has no tendency to translate or move it bodily. Terrestrial magnetism acts differently at different places; what are called the *magnetic elements* of a place are the direction of the needle in regard to the points of the horizon (*variation or declination*), its direction in regard to the vertical (*inclination or dip*), and the force that keeps it in these positions (*intensity*). For the first two elements, see **DECLIN-**

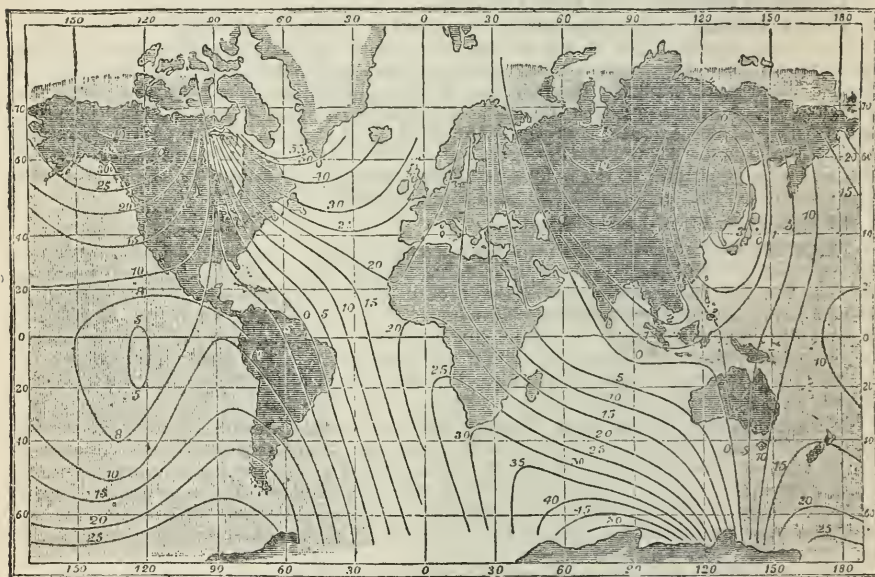


FIG. 1.

ATION-NEEDLE and DIPPING-NEEDLE. The element of intensity is more difficult to determine. The relative horizontal intensity is measured by the number of oscillations that a needle, of unit size and strength, when disturbed makes in a given time, the intensities of two places being as the squares of the oscillations. The total intensity is got by dividing the horizontal intensity by the cosine of the angle of dip. Gauss has succeeded in reducing this measurement from a relative to an absolute standard.

Magnetic Charts.—The magnetic elements have been ascertained with great care at different portions of the earth's surface. The knowledge thus obtained has been embodied in magnetic charts, in which the points at which the declination is the same are joined by lines, and similarly those where the dip and intensity are alike. The lines of equal declination are called the *isogonic lines*; those of equal dip, *isoclinic*; and those of equal intensity, *isodynamic lines*. As the magnetism of the earth is subject to a slow secular variation, such charts are only true for the time of observation. The chart, fig. 1, was drawn up by col. Sabine for the year 1840, and gives an approximate view of the lines of equal declination for that year. The change since 1840 has been small, so that an isogonic chart for the present time would differ but slightly from it. The chart sufficiently explains itself. Attention may, however, be given to one or two points. The declination is marked on each line. Thus, the line passing through England, for instance, is marked 25°, and that passing n.w. of the British islands, 30°. At places under those lines the needle points to a n. 25° and 30° w. of the true north. On the space intervening

between these lines, including Scotland and Ireland, a correction, varying from 0° to 5° , must be made according as the station lies more toward the one line than the other. The westerly line of no declination passing northward cuts off the eastern corner of South America, proceeds to North America, which it enters at North Carolina, traverses the continent by lakes Erie and Huron and the w. of Hudson's bay, and ends in the n. of the continent at Boothia. The easterly line of no declination passing southward enters Europe in the n. of Russia, crosses the White sea to the e. of Russia, of the Caspian sea, of Persia, and the Arabian sea; then turns eastward, and cutting off the w. of Australia, passes southward. The space included between those two lines, and which in the chart is left untinted, constitutes, so to speak, the hemisphere of westerly declination. It includes the e. of the two Americas, the Atlantic ocean, the whole of Europe and Africa, and the w. of Asia and Australia. The rest of the earth, which in the chart is tinted, has an easterly declination. There is an elliptic space in Eastern Asia which is left white, having a westerly variation, and forms an exceptional region in the eastern magnetic hemisphere.

It will be seen that the lines converge in the n. of North America, and in the s. of Australia. So far as experience goes, and so far as the most matter-of-fact theory (Gauss's) teaches, the convergence in both cases is to a point. The point in North America is the *north magnetic pole*, and that s. of Australia is the *south magnetic pole*. At these points, then, all isogonic lines converge, and a compass-needle lies indifferently in any position.

These isogonic lines, as seen from the chart, form a somewhat complicated system. This arises from the fact that we refer the indications of the needle to the geographical poles, which are, so far as we know, arbitrary or extraneous as regards terrestrial magnetism. Duperrey, by drawing what he calls *magnetic meridians and parallels*, draws a system of lines which have much the same conformation with regard to the magnetic poles that the meridians and parallels of latitude have to the geographical poles. A magnetic meridian, according to Duperrey, is the line that would be described by a person setting out, say from the south magnetic pole, and traveling always in the direction of the magnetic n. till he reached the n. magnetic pole. The magnetic parallels are lines drawn at right angles to the magnetic meridians.

In an isoclinic chart by the same author and for the same epoch in the upper part of the chart, which is left white, the n. end of the needle dips; and in the lower part, which is tinted, the s. end of the needle dips. The amount of dip is marked on lines. Thus, the line passing through the center of England is marked 70° . A dipping-needle, at any place cut by the line, is inclined 70° to the horizon. The line 75° passes to the n. of the British isles. In Ireland and Scotland, therefore, the dipping-needle has an inclination greater than 70° , and less than 75° . The line marked 0° is the line of no dip; at any station on it the dipping-needle is horizontal. This line is called the *magnetic equator*. It is not coincident with the geographical equator; it is not even a great circle of the earth, but is an irregular curve cutting the equator in two points, one near the w. coast of Africa, and the other in the middle of the Pacific ocean. The points on the earth's surface where the dipping-needle stands vertical, and where, in consequence, as before mentioned, the compass-needle lies in any direction, are called the magnetic poles. The n. magnetic pole was found in Boothia Felix by capt. Ross at $70^{\circ} 5' \text{ n. lat. and } 263^{\circ} 14' \text{ e. long.}$ According to Gauss's calculation, it should have been at the time (1831) some $3^{\circ} \text{ n. of this point.}$ From observations made at Hobart Town, the nearest station to it, the s. magnetic pole should lie $66^{\circ} \text{ s. lat. and } 146^{\circ} \text{ e. long.}$ These points are not diametrically opposite each other, as the geographical poles. If the lines of equal dip were drawn on a globe, they would form round the magnetic poles a system of irregular circles, somewhat resembling that of the parallels of latitude round the poles of the earth.

We do not add an isodynamic chart, as it would take up too much space. Col. Sabine's dynamical chart, along with the isogonic and isoclinic charts, will be found fully engraved and explained in Johnston's *Physical Atlas* (new edition). From this chart we learn that the magnetic intensity is least in the vicinity of the magnetic equator, and increases as we approach the magnetic poles. The lines of equal intensity, though running much in the same direction as the lines of equal dip, are neither coincident nor parallel with them. The line of least intensity, itself not an isodynamic line, runs nearly parallel to the magnetic equator, but lies, except in the western half of the Pacific, a few degrees to the s. of it. We thus learn that the changes in direction and intensity do not march together. We should fancy that at that point or points on the earth's surface where the dipping-needle stood erect we should be nearest to the center of free magnetic energy, and that there the force would be greatest; but this is not the case. The point in North America where the intensity is greatest is situated to the w. of Hudson's bay, some $18^{\circ} \text{ s. of the n. magnetic pole.}$ But this is not the only point of maximum force in the n. magnetic hemisphere. There is another, which was found by Hansteen in 1828, in Northern Siberia, about the longitude 120° . This maximum point is weaker than the American, in the proportion of 100 to 107 (Sabine). According to Gauss, there can only be one maximum point in the southern hemisphere which is stronger than either of the other two. It lies n.e. of the s. magnetic pole, and its intensity is 137 (Gauss) compared with 107, that of the principal northern center. At none of those

points does the dipping-needle stand erect. This want of coincidence of the points of vertical dip and of maximum intensity has led to some confusion in the use of the term magnetic pole; some writers meaning by it a point of vertical dip, and others a point of maximum intensity. In adopting the former definition we are only adhering to the popular meaning of the word, and to the opinion of Gauss, perhaps the greatest authority on the subject. Some of the best English authorities, however, attach to it the latter meaning.

Although the total intensity increases as we go northward or southward from the line of least intensity, the horizontal intensity diminishes. This arises from the fact that the greater the dip the less the horizontal intensity. Hence the compass-needle, which is affected alone by the horizontal intensity, oscillates more sluggishly as we leave the line of least intensity. A dipping needle, for instance, oscillates faster at London than at Calcutta, because the total intensity which affects it is greater at London than at Calcutta; but with a compass-needle it is the reverse, from the horizontal intensity being greater at the latter than at the former station.

Variations of the needle.—The magnetic elements do not remain constant in the same place, but are subject to continual though small variations. These are regular and irregular. Under regular variations are included *secular*, *annual*, and *diurnal* variations. The secular variations take centuries for their completion. The following list of the declination and dip at London in different years will give an idea of the secular variations for these elements:

Year.	Declination.	Year.	Inclination.
1576.....	11° 15' easterly.	1720.....	74° 43'.
1657-62.....	0° 0' no declination.	1780.....	72° 8'.
1760.....	19° 30' westerly.	1800.....	70° 35'.
1815.....	24° 27' 18" westerly.	1830.....	69° 38'.
	MAXIMUM.	1850.....	68° 48'.
1850.....	22° 29' 30" westerly.	1865.....	68° 9'.
1865.....	21° 6'	1875.....	67° 47'.
1875.....	19° 33'		

At present the annual decrease of declination at Kew is 8'. At this rate it would take rather more than 84 years for the compass-needle to shift through a whole point. From the observations of the dip we find that it has been gradually decreasing for the last 150 years. The annual decrease of dip is at present about 2.6'. The time during which observations have been taken of the declination and dip is far from comprehending a cycle of change in either, and it is a mere matter of speculation how long that may take. The magnetic history of London does not apply to other places, each place, so far as has been ascertained, having a magnetic history of its own. Thus, in Paris, the time of no declination was 1669; and of maximum declination, 1814; the latter amounting to 22° 34' west. Every place, according to Barlow, appears to have its own magnetic pole and equator. Magnetic intensity has been observed for so short a time that little as yet is known of its secular variation. At present the horizontal intensity is increasing in Europe, but that may arise partly from decrease of dip.

The magnetic elements are also subject to changes, which have a yearly and a daily period. In describing these shortly, we shall limit ourselves to the changes affecting declination, as these are of most general interest. The following are the chief particulars of the *annual variation* of declination given by Cassini: From April to July, or from the vernal equinox to the summer solstice, the western declination decreases. From the summer solstice to the vernal equinox, that is, during the other nine months of the year, the declination increases, the needle turning to the west. Its position in May and in October is nearly the same; so that in the winter months, from October to April, the westerly motion is slow. The range of the annual variation at Kew is 58' 55".

The mean *diurnal variation* for Kew is shown in fig. 2. The irregular line indicates the course of the n. end of the needle. A rise of this line indicates a change of the n. end to the e.; a fall, a change to the west. The interval between two horizontal lines corresponds to a deflection of the needle 1' to the e., and a fall 1' to the west. The line marked *o* is the magnetic meridian, or the mean daily position of the needle. The interval between two upright lines corresponds to an hour. The course begins at twelve at night, and ends at twelve the following night. At twelve at night, the magnet is 14' e. of the mean position, and continues nearly in the same position, with only a slight westerly deviation, till 15 hours (three in the morning), when it veers eastward. At 20 hours (eight in the morning), it reaches its furthest e. point. From eight in the morning till one in the afternoon, it makes a sweep of 10' toward the w., and then stands about 6' to the w. of the mean. After one, it goes westward till midnight, when it again begins the same course. The needle stands in its mean position a little after ten in the morning, and a little before seven in the evening. The course here described is the course for the year. But the diurnal range is different in different months. In May, for instance, the average range between the extreme points is 12', which is the maximum range for the year; and in December, when it is a minimum, it is only 5' 28". The diurnal changes here described for Kew are much the same all over the n. magnetic hemisphere. The amount, however, is different. Near the magnetic equator the diurnal variation is little

or nothing, and it increases as we go northward. Captain Duperrey states that at or near the magnetic equator, the n. point of the needle in the morning shifts slightly e. or w. of the mean, according as the sun passes s. or n. of the station. In the southern magnetic hemisphere, the daily motions of the needle takes place much in the same way as in the northern hemisphere, only the s. pole take the place of the n. pole, and the direction of the deflections is reversed. The correspondence, and at the same time opposition, of the southern hemisphere is also shown from the time of maximum and minimum range. When the sun is in the northern signs of the zodiac, the range is a maximum in the northern, and a minimum in the southern hemisphere; and when the sun is in the southern signs, the reverse takes place. The diurnal variation is so small, that the ordinary compass-needle is not delicate enough to show it.

The *irregular variations* are those which break in upon the regular march of the diurnal variation, without in the main altering it. Instead, for instance, of the needle steadily going westward from 8 A.M. to 1 P.M., as shown in fig. 2, it makes, when affected by irregular variation, deflections eastward as well as westward, although it in

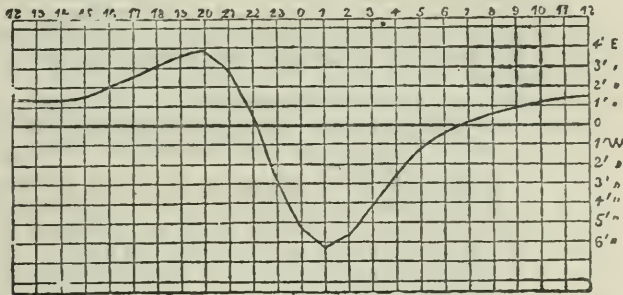


FIG. 2.

the main moves westward; so that the line between these hours, instead of being comparatively straight, would be an irregular zigzag. These disturbances of the mean course are sometimes considerable, amounting even to one or two degrees in extreme cases. On some days, the mean diurnal course is much disturbed, on others, very little; but it is never quite free from them. It has been found that places of the same longitude have similar disturbances at the same time; that those on opposite sides of the globe, or differing by 180° of longitude, have disturbances equal in amount, but opposite in direction; and that those situated 90° w. or e. of the disturbed regions, have little or no disturbance. The appearance of auroras is invariably accompanied by magnetic irregularities, and their effect extends far beyond the regions where they are visible. Earthquakes and volcanic eruptions have also a marked effect in this way. Humboldt gave the name of *magnetic storms* to these irregular disturbances. The frequency of these storms, and the amount of the diurnal variation, are found to be the greatest when sun-spots are most numerous. See SUN.

1. *Theories of Terrestrial Magnetism.*—The earliest theory was that suggested by Gilbert, in which it is supposed that a magnet in the middle of the earth extends from one magnetic pole to the other. On this supposition, the general phenomena of terrestrial magnetism may be accounted for—a needle, both by declination and dip, must point to the poles. This must always remain, from its simplicity, the popular theory on the subject. In consistency with his theory, Gilbert considered the n. pole of the magnet to be a s. pole, as he took the n. pole of the earth for his standard n. pole. If this theory were correct, the magnetic equator would be a great circle of the earth, and the magnetic poles would be 90° from it, which is far from the case. It is only a rough approximation to a just theory.

Halley endeavored to supplement Gilbert's theory by supposing two magnets of unequal strength crossing each other at the earth's center to be the cause of terrestrial magnetism. The theory of the two magnets or four poles was ably defended by Hansteen.

Barlow considered that the earth acted on the needle as if currents of electricity traversed it from e. to west. He imitated its action by wrapping a wire in parallel coils round a wooden globe, and causing a galvanic current to pass through it. Each turn of the wire represented a magnetic parallel, and the two ends of the coil the magnetic poles; and, to complete the analogy, the globe was movable on an axis, which stood in the same relation to the ends of the coil as the astronomical to the magnetic poles of the earth. When a small needle was placed on the globe, its declination and dip bore a striking resemblance to those of a needle similarly situated on the earth's surface. The objection to this theory is the difficulty of accounting for the origin of such currents in

the earth. To meet this, some suppose the earth to be a huge thermo-electric pile; as the heat of the sun falls on one side of it, currents are there generated which travel round the globe. But how, again, it may be asked, are the conditions of thermo-electricity implemented by the materials of the earth? This question still remains to be answered. The close connection between temperature and magnetism is shown by the diurnal variation of declination, the epochs of which closely correspond with those of the daily temperature, and by the fact that the isodynamic and isothermal lines manifest a marked correspondence. Sir David Brewster has also shown that there are two centers of maximum cold in the northern hemisphere, which are situated near to the two intensity poles.

Gauss did not start from any simple supposition of one or two magnets giving rise to the magnetism of the earth, nor did he assert or deny its electric origin. Considering the whole earth as magnetic, he aimed at determining how it must act as a whole at the different points on its surface. In order to make the equations he obtained theoretically in this attempt express the distribution on the earth, the magnetic elements of eight stations at a sufficient distance from each other on the earth's surface had to be ascertained and substituted in these equations. This done from the longitude and latitude of any station he considered himself prepared to deduce its magnetic elements. The magnetic charts which he sketched, though founded on the imperfect observations to which he had access, are singularly in keeping with fact, and go far to establish the correctness of his reasonings.

The secular variations are as yet wholly unaccounted for. The cause of the diurnal variation is universally attributed to the sun. Secchi, who carefully studied the diurnal variation of the needle, considers that the sun, so far as they are concerned, acts upon the earth as a powerful magnet at a distance.

Historical Sketch.—The discovery of the change in declination at different places is generally attributed to Columbus, and was one of the many important observations of his memorable voyage across the Atlantic. Robert Norman, an instrument maker in London, first discovered the dip of the needle in 1576. He was led to it by finding that needles nicely balanced before magnetization had to be slightly loaded on the s. end, to keep them horizontal after being magnetized. Gilbert (1600) gave the first theory of terrestrial magnetism, viz., that of the single magnet. Halley, the astronomer royal, published his theory of the four poles in 1683. In 1688 and 1689, at the expense of government, he made two magnetic voyages, the results of which he embodied in his charts of the lines of equal declination, published in 1701, which were the first magnetic charts ever published. In 1722, the diurnal variation was discovered by Graham, the celebrated instrument-maker of London. The first inclination chart was published by Wilke at Stockholm, 1768. Humboldt inaugurated the present system of careful observations of terrestrial magnetism by taking comparative measurements of the magnetic elements at Peru and Paris (1799-1803). Hansteen's work on the *Magnetism of the Earth* was published at Christiania, 1817; in 1826 he published the first isodynamic charts. Barlow (1831) suggested the electric origin of terrestrial magnetism. In 1831, captain Ross came upon the n. magnetic pole. In 1835, stations were established throughout Europe, and the observations were published by Gauss and Weber, 1836. Gauss (1823-1840) perfected his theory. In 1837, col. Sabine published an isodynamic chart of the whole globe. Observations were made (1840-1854) at stations throughout the British empire by British officers, under the direction of col. Sabine.

TERRESTRIAL TEMPERATURE. The distribution of heat over the globe is represented by isothermal lines, or lines drawn through all places having the same mean temperature.

The part of the globe having the highest mean annual temperature forms an irregularly shaped belt, lying along the equator, and comprised between the n. and the s. isothermals of 80°. On either side of this warm belt the temperature diminishes towards the poles; and the lines in a chart showing successively this diminution are, speaking in a very loose sense, arranged parallel to the equator, thus showing the all-predominating influence of the sun as the source of terrestrial heat. The coldest portion of the earth's surface is a small oval-shaped patch near to but not surrounding the n. pole, its mean temperature being -4°. Its narrowest diameter lies n. and s. nearly touching the pole on the one side, and extending on the other as far s. as 72° 30' n. lat. in 130° w. long. On looking at a chart representing the isothermal of 0°, one might be led to suppose that there are two centers of greatest cold, one n. of Siberia, and the other n. of British America. Such, however, is not the case—the apparent double center of greatest cold being solely due to the isothermals being drawn on Mercator's projection of the earth; for if an isothermal map be drawn on a polar projection, the lines of mean annual temperature inclose one connected space of greatest cold, and not two such spaces, as is not unfrequently stated.

While the decrease of temperature in advancing toward the poles corresponds in a general way to what may be called the solar climate, there are deviations brought about by disturbing causes too important to be overlooked. These disturbing causes are (1) the currents of the sea; (2) the prevailing winds; and (3) large surfaces of water which are frozen during part of the year.

The influence of an oceanic current depends on the temperature of the place it leaves and the place at which it arrives. Hence the great equatorial current, flowing from east to w. does not require to be considered here, because the heat remains the same throughout its course; but only those currents which convey the waters of the sea to higher or to lower latitudes. Of these, the most marked and important is the Gulf stream in the North Atlantic, which, by conveying warm water to the arctic regions, pushes the isothermals many degrees to the northward. There is a similar, though much feebler, current passing from the North Pacific to the Arctic Sea through Behring's strait, and there, accordingly, the isothermals are pushed a little to the northward. In the southern hemisphere, there are two currents, one discovered by Humboldt, passing from the Antarctic Ocean northward by the coast of Peru as far as Lima; the other flowing from the cape of Good Hope northward along the w. coast of Africa: these currents, flowing from colder to warmer latitudes, lower the temperature, and thus drive the isothermals toward the equator. Again, the great equatorial current, after impinging on the e. coast of Africa, turns southward, and by the warmth it imparts, pushes the isothermals into higher latitudes. For the same reason the current flowing southward past the coast of Brazil, raises the temperature in the e. of that country. The influence of these great currents is more distinctly marked in the forms of the isothermals for January and July. Thus, in January, when the relative excess of the temperature of the Gulf stream is greatest, the isothermals are driven very far to the north; and similarly in the southern hemisphere, the currents from the Antarctic Ocean being coldest in July, the isothermals are deflected more toward the equator during that month. The most remarkable lowering of the isothermals occurs in Labrador and Newfoundland during May and June, and is caused by the icebergs which then descend on these coasts from Davis's strait.

Since winds bring with them the temperature of the regions they have crossed, the equatorial current is a warm wind, and the polar a cold wind; also winds arriving from the ocean are not subject to such variation of temperature during the year as winds from a continent. As an atmosphere loaded with vapor obstructs both solar and nocturnal radiation, it follows that moist winds are accompanied with a warm temperature in winter, and a cool temperature in summer; and dry winds with cold winters and hot summers. The direction of mountain-ranges is also an important element to be taken into account in estimating the influence of winds on temperature. These considerations explain the position of the isothermals in the north temperate zone, where the prevailing wind is the s.w. or anti-trade (see WINDS). In January, the western parts of each continent enjoy a comparatively high temperature, from their proximity to the ocean, whose high temperature the winds waft thither; and they are further protected from extreme cold by their moist atmosphere and clouded skies. But in the interior of the continents it is otherwise; for the winds getting colder as they advance, and being deprived of their moisture as they cross the mountains in the w., the soil is exposed to the full effects of radiation during the long winter nights, and as a consequence, the temperature rapidly falls. In the center of Siberia, the January temperature falls to -40° , which is 9° colder than the coldest part of the American continent; and this center of greatest cold lies near the eastern part of the continent of Asia. On the other hand, in July, the interior of continents is much warmer than their western parts. Hence the interior and eastern parts of Asia and America are characterized by extreme climates, and the western parts by equable climates. Thus, at Yakutsk, in Siberia, the July temperature is $62^{\circ}.2$, and the January $-43^{\circ}.8$, the difference being $106^{\circ}.0$; while at Dublin these are respectively $60^{\circ}.8$ and $38^{\circ}.5$, the difference being only $22^{\circ}.3$. This constitutes the most important distinction of climates, both as respects vegetable and animal life. On man especially the effect is very great—the severity of the strain of extreme climates on his system being shown by the rapidly increasing death-rate as the difference between the July and January temperatures increases.

The great fresh-water lakes of North America—lakes Superior, Huron, Erie, Michigan, Ontario, Bear lake, etc.—exercise an important influence on the climate of the central parts of North America, for in winter, America, with its frozen lakes, is a truly unbroken continental mass, and its winter climate is therefore continental; whereas in summer its numerous large sheets of fresh water communicate to it many of the features of an insular summer climate.

The whole effect of the disturbing causes is seen at once, if we compare the observed temperature of a place with its normal temperature, that is, the temperature due to it in respect of its latitude. In the northern hemisphere, in January, the sea and the western parts of the continents are in excess of their normal temperature; elsewhere, there is a deficiency. There are two centers of excess, one to the n.e. of Iceland, amounting to 41° ; the other in Russian America, amounting to only 18° ; and two centers where the temperature is deficient, one at Irkutsk, amounting to 41° ; and the other w. of Hudson's bay, amounting to 27° . In July, the United States, Europe, Asia, the Indian ocean, the n. of Africa, and the extreme n. of South America, have their temperature in excess, while elsewhere it is deficient. The centers of excess are: n. of Siberia, $13^{\circ}.5$; Red sea, $11^{\circ}.0$; and n.w. of the United States, $4^{\circ}.5$; and the centers where the temperature is deficient are: the entrance to Hudson's bay, $11^{\circ}.0$; and the Aleutian islands, $11^{\circ}.0$.

TERRIER, a small kind of dog, remarkable for sagacity, vivacity, courage, and eagerness in the pursuit of "vermin," which it readily follows into burrows; whence apparently the name terrier, from Lat. *terra*, the earth. The courage of the terrier, however, is such that it will readily attack animals much larger than itself; and it has been observed in India that terriers will fearlessly rush at the largest carnivora, when even the bull-dog hesitates. Terriers are of great use for killing rats in places much infested by them. They are also used for compelling the fox to leave his retreat; and a large variety called the *saufinder*—that is, boar-seeker—is employed in Germany to rouse the fiercest beasts of the forest from their lairs. The varieties of terrier are numerous. In Britain, two are particularly prevalent, known as Scotch and English terriers—the former with long, rough, wiry hair, with which even the face is much covered; the latter with smooth, short hair. The ears are either erect and pointed, or have pendent tips. The Skye terrier is a breed of Scotch terrier, peculiarly prized. If any kind of dog may be regarded as truly indigenous in Britain, it is the terrier; but there is no certainty that it was not imported by the first inhabitants. Dogs very similar have existed in the north of Europe in a domesticated state from remote antiquity. The **BULL TERRIER** is probably a cross between the terrier and the bull-dog (q. v.).

TERRITORIES, in the United States and under similar governments, are those portions of the public lands set off by congress and still under its direct authority, while having the capacity to become states whenever congress gives its consent. Each territory has a governor, a judiciary, and other administrative officers appointed by the president; and has a territorial legislature, the exercise of whose powers, limited in their degree, is subject to congressional revision. Usually, as soon as a territory has a population sufficient to entitle it to a representative in congress, it is empowered by act of congress to adopt a state constitution, whereupon it is admitted into the union. The present (1881) number of U. S. territories is 6.

TERRY, ALFRED HOWE, b. Conn., 1827; educated at the Yale law school. He was clerk of the Connecticut superior and supreme courts, 1854-60; col. of a Conn. regiment at the beginning of the war of the rebellion; and took part in the first battle of Bull Run. In command of another Conn. regiment he was at the capture of Port Royal. He took command of fort Pulaski after its capture; was made brig. gen. of volunteers in 1862. took part in the operations around Charleston, and at forts Sumter and Wagner. In 1861 he led a division of the army of the James, participated in the Virginia campaign, and was at Bermuda Hundred and the siege of Petersburg. He led a second expedition against fort Fisher in 1865, and took it by storm Jan. 15. He was soon made a brig. gen. in the regular army, and maj. gen. of volunteers for this victory. He assisted in the capture of Wilmington, and commanded the 10th corps during the North Carolina campaign. He has commanded a number of departments since the war.

TERSCHELLING, one of the chain of islands to the n. of Holland, lies in 53° 24' n. lat., the principal villages being Oosterschelling, Westerschelling, and Midsland. It consists of fertile, arable, and meadow lands, is protected on the s. by large dykes, and in other parts by dunes, which are carefully preserved. Area about 45 sq. m.; Pop. 3,128. There is a good haven, a shipbuilding-yard, a woolen dyework, etc. The old church of the hamlet of Stroe (Strü) is supposed to be a former heathen temple. Terscelling was the birthplace of William Barentz, the celebrated Arctic explorer. See **NORTH-EAST PASSAGE**.

TERTIAN FEVER. See **AGUE**.

TERTIARY (Lat. *Tertiarius*, one of the third rank), a name given by church writers to a class in the Roman Catholic church, who, without entering into the seclusion of a monastery, aspire to practice in ordinary life all the substantial obligations of the scheme of virtue supposed to be laid down in the gospel. Whatever earlier traces of this institution may be observable, there is no dispute that it was under St. Francis and the mendicant orders generally that the institute of tertiary, reached its full development. The rules of the institution of tertiary, such as they have since substantially been maintained, were made public in 1221. The associates must, of course, all be members of the church; and it is moreover required that all shall be of good repute and blameless life. The intending members must restore all ill-gotten goods, must renounce all evil practices, and abandon all feuds and enmities with their neighbors. Wives cannot be received without the consent of their husbands. The obligation of tertiary once accepted, is irrevocable, unless the party should be released, or should enter into a more strict religious order. The members are required to renounce luxury of life, profane exercises and amusements, costly or unseemly dress, and the use of arms, except in the necessity of self-defence. They must frequent the sacraments; hear mass, if possible, daily; observe the fasts of the church, as well as certain special austerities; avoid contention, litigation, and unnecessary oaths; cultivate charity toward all, with special obligations toward needy, sick, or afflicted brethren, and practice with more than common fervor the great Christian virtues. The tertiary are placed under the authority of superiors elected at intervals, and for a stated period, and are liable to an annual visitation, conducted by a priest appointed for the purpose. It is to be observed,

however, that none of these obligations were supposed to bind the members under pain of mortal sin.

Such was the celebrated institute of the tertiary, or the third order of St. Francis. Similar lay associations were organized in connection with the Dominican, Carmelite, and Augustinian, as well as with certain of the more modern orders; and a brotherhood of the same character had already been formed by the Templars. It ought to be added, that the tertiary institute, properly so called, is quite distinct from that of the lay "confraternities" which exist in connection with the several orders, and the objects of which are very similar.

TERTIARY, the term applied in the science of geology (q.v.) to all the strata of the earth's crust above the cretaceous rocks, with the exception of those superficial beds which have recently been raised to a distinct group, under the title of the quaternary system, or recent period. There is considerable difference of opinion as to the division-line between the two systems, some including the boulder clay and its associated beds in the one, and some in the other group. Tertiary is synonymous with *cainozoic*, and is divided into the *pleiocene* (q.v.), *miocene*, and *eocene* (q.v.) periods.

TERTULLIAN, a father of the church, and one of the earliest who used the Latin language in written compositions. In one passage, the genuineness of which there is no reason to doubt, he calls himself *Septimius Tertullianus*. The best manuscripts call him *Quintus Septimius Florens Tertullianus*. He was the son of a proconsular centurion—that is, a centurion who attended on the proconsul. He was born in Carthage. He was brought up a heathen, and from his own writings we learn that he was licentious in his conduct, and fond of the public shows. We know nothing more of his heathen life. Eusebius describes him as a man exceedingly well acquainted with the laws of the Romans, and his writings bear out the assertion. From this circumstance, some have identified him with a Tertullianus whose name occurs in the index of the *Pandects*, and have supposed that he acted as an advocate; but the supposition is a mere conjecture. We know nothing of his conversion. He became a presbyter in the church, but whether he held this office in Rome or in Carthage, is matter of dispute, and there are no data to determine the question. It is certain that he visited Rome, and was well acquainted with the affairs of the Roman church. He also married; and as his wife was a Christian, it is supposed that his marriage took place after his conversion. After remaining a presbyter until he had reached middle age, he became a Montanist. Jerome attributes his adoption of Montanism to the insulting treatment which he received at the hands of the Roman clergy. But this is not likely an entirely accurate account of the matter. Jerome himself had been ill treated by the Roman clergy, and was therefore inclined to blame them; and in the character and general tendency of Tertullian's opinions, we have ample explanation of his passing over to Montanism. See **MONTANUS**. He lived to a good old age, remaining a Montanist to the last. We have no clue to precise dates in the history of Tertullian. Jerome states that he flourished under Severus and Antoninus Caracalla. Allix places his birth at 145 or 150 A.D., and his death at about 220 A.D.; but these are conjectures.

Tertullian was a man of strong and violent passions: he loved and hated with intensity. He possessed considerable culture, and was well versed in Roman law, in ancient philosophy, history, and poetry. He was not deficient in philosophical power, but he was narrow, bigoted, and uncharitable. He shows no sympathy with Greek speculation or with freedom of human thought; and he shows little sympathy with the joys and pleasures of man, being strongly inclined to asceticism. We need not wonder, therefore, that he came to believe in the paraclete of Montanus as the revealer of the perfection of Christianity, and that he adopted the Montanist opinions, that second marriages were adulteries, and that it was unlawful to flee in times of persecution, and wrong to receive the lapsed back into the communion of the church.

His writings are numerous. Attempts have been made to divide them into those which were written before he became a Montanist, and those written after that event; but the attempts have failed; for in treating many subjects he would have no occasion to say a word in regard to the paraclete, second marriages, or persecution.

His works are interesting, throwing much light on the internal circumstances of the church, on the social questions which perplexed Christians, on the opinions of heretics, and on the development of doctrine. Of his theology, Neander remarks: "In Tertullian we find the first germ of that spirit which afterward appeared with more refinement and purity in Augustine, as from Augustine the scholastic theology proceeded, and in him also the reformation found its point of connection." Among the peculiar opinions which he held may be mentioned his belief in the corporeality of the human soul.

His writings had great influence on the subsequent ages, but especially on Cyprian. Jerome says: "I saw at Concordia, in Italy, an old man named Paulus. He said that, when young, he had met at Rome with an aged amanuensis of the blessed Cyprian, who told him that Cyprian never passed a day without reading some portion of Tertullian's works; and used frequently to say: *Give me my master*, meaning Tertullian."

There are many editions of Tertullian; the best is by Franciscus Oehler (3 vols. 8vo. Lps. 1853). The third volume contains the principal dissertations on the life and writ-

ings of Tertullian. The works of Tertullian, with many dissertations and notes, form the first and second volumes of Migne's *Patrologia Latina*. The English reader will find a full and satisfactory account of Tertullian's life, writings, and opinions in bishop Kaye's *Ecclesiastical History of the Second and Third Centuries, Illustrated from the Writings of Tertullian* (8vo, 2d ed. Cambridge, 1829); and in Neander's *Anti-gnosticus or the Spirit of Tertullian*, translated by J. E. Ryland. A good translation of Tertullian's works will be found in Clark's *Anti-Nicene Christian Library*, edited by Drs. Roberts and Donaldson.

TERUEL, a province in n.e. Spain, adjoining Tarragona, Valencia, Saragossa, Castellon, Cuenca, and Guadalajara, and forming part of Aragon; drained by the Tagus, Guadalupe, Guadalaviar and smaller streams; 5,494 sq. m.; pop. '70, 252,201. The surface is mountainous in part, being traversed by the Albarracin range from e. to w.; but there are large and richly productive plains, from which large quantities of wine, oil, fruit, hemp, and flax, are exported. The making of raw silk is an important industry. There are manufactures of linen and woolen goods and other articles. Capital, Teruel.

TESCHEN, a t. of Austrian Silesia, on the right bank of the Olsa, 38 m. e.s.e of Troppau. Pop. '69, 9,779. Here, in 1779, a treaty of peace was concluded between Maria-Theresa and Frederick II., by which the dispute of the Bavarian succession was brought to an end.

TESSERÆ, the small square tiles or cut stones used in forming tessellated pavements.

TEST ACTS, otherwise called *corporation acts*, the popular name given to two English statutes imposing certain oaths on the holders of public offices. Act 13 Car. II. c. 2, directs that all magistrates shall take the oath of allegiance and supremacy, as well as an oath renouncing the doctrine that it is lawful to take arms against the king, and provides that they must receive the communion according to the rites of the church of England within a year before their election. Act 25 Car. II. c. 1, imposed the like conditions on the holders of all public offices, civil and military, and obliged them in addition to abjure all belief in the doctrine of transubstantiation. These acts, which were practically evaded to a large extent by means of an act of indemnity passed every year, were repealed by 9 Geo. IV. c. 17, in so far as regarded the administration of the sacrament, for which a declaration set forth in that act was substituted. A statute of William IV. substituted a declaration for an oath in most government offices. A new form of oath has been substituted for the oaths of supremacy, allegiance, and abjuration by 21 and 22 Vict. c. 48.

TESTAMENT. See **BIBLE**.

TESTAMENT. See **WILL**.

TESTA TUM is one of the clauses of an English deed, otherwise called the witnessing or operative part, commencing at the words, "Now this indenture witnesseth that," etc.; and it includes a statement of the consideration-money, and the receipt thereof.

TESTER, or **TESTOON**, a flat canopy over a tomb, pulpit, etc.

TESTICLES. See **REPRODUCTION**.

TESTIMONIUM, in an English deed, otherwise called the attestation clause, is that part which states that the party signed the deed, beginning with the words, "In witness whereof."

TESTING, in chemistry, embraces a series of processes, the details of which would occupy far more space than the general plan of this work would admit of. Indeed, testing may be regarded as equivalent to qualitative analysis. As a simple illustration of the process of testing, we will assume that the most common of all chemical compounds, a salt, is submitted for examination. The student must pursue some such course as the following: 1. He must examine the dry substance before the blow-pipe, and note whether (a) it is volatile, as are the salts of ammonia and mercury; or (b) fusible, as are the salts of potash and soda; or (c) infusible, as are the salts of zinc, alumina, magnesia, lime, strontia, and baryta; or (d) reducible, as are the salts of silver, tin, lead, bismuth, antimony, and cadmium; and (e) whether it gives a coloration to the borax bead, and what that color is. 2. Having made his blow-pipe examination, he must bring his substance to a finely-divided state, and dissolve it, if possible, in water, and if it is insoluble in that fluid, even with the aid of heat, in hydrochloric or nitric acid. The solution, whether in water or acid, to which no test or reagent has been applied, is termed by Odling (*A Course of Practical Chemistry*, 2d ed. 1865) and others the *original solution*; and to this are added various tests, such as sulphureted hydrogen, hydrosulphate of ammonia, ammonia, nitrate of silver, etc. The most common effect resulting from the addition of a gaseous or liquid reagent is to cause a *precipitate* or solid deposit of either the base or acid sought for. These precipitates differ in their color, consistency, etc.; and the student must note not only the color of the precipitate (although this is the most important point), but also whether the deposit is crystalline, gelatinous, clotty, etc. 3. He must then ascertain to which group the base he is seeking for belongs. There are three great groups of bases; the members of the first group being precipitated from their acid or acidified solutions by sulphureted hydrogen (hydrosulphuric acid); those of the second

group not being thrown down by this reagent, but being precipitated from neutral solutions by hydrosulphate of ammonia (sulphide of ammonium); while those of the third group are not thrown down by either of these reagents. The first group includes tin, arsenic, antimony, bismuth, mercury, lead, silver, copper, and cadmium; the second, nickel, cobalt, manganese, iron, chromium, aluminium, and zinc; and the third, barium, strontium, calcium, magnesium, potassium, sodium, and ammonia. (See Odling, *op. cit.* p. 64). 4. Having ascertained to which base the group belongs, the next point is to identify it. For information on this point the reader is referred to any of the standard works on qualitative analysis, or on practical chemistry. 5. The base being thus determined, it remains to determine the acid, and in searching for it the student will be much assisted by a knowledge of the solubility of the most important classes of salts. Knowing, for example, the insolubility of the sulphates of baryta and strontia, he need not search for sulphuric acid in a soluble salt of one of these earths. On the other hand, a salt insoluble in water is not likely to be a nitrate or chlorate, or acetate or chloride (the only chlorides insoluble in water being chloride of silver and calomel). We cannot enter into the testing for acids further than to observe that the nitrates and chlorates deflagrate; the tartrates and citrates char; the carbonates effervesce when acted on by an acid more energetic than carbonic acid; the silicates, borates, and benzoates are precipitated by hydrochloric acid; and the arseniates and chromates react with hydrosulphuric acid. The presence of any particular acid is more or less indicated by its behavior, while still in union with the base, with strong sulphuric acid, which in many cases causes the evolution of characteristic fumes or vapors; and among the tests especially applicable for the detection of the acids (in acid solutions) are solutions of nitrate of baryta, nitrate of silver, chloride of calcium, and perchloride of iron. As the above remarks apply merely to the detection of the base and acid contained in a single salt, it will readily be understood how much the difficulties are increased when there is a mixture of several salts, or where, in place of a metallic oxide, a vegetable base is present, or where we have to deal with a complicated mixture of organic and inorganic substances, as, for example, in the investigation of the contents of the stomach in a case of suspected poisoning.—The following works on the subject may be referred to: Fresenius's *Qualitative Analysis*; Noad's *Qualitative Analysis*; Greville Williams's *Outlines of Chemical Manipulation*; Bowman's *Practical Chemistry*; and Odling's *Practical Chemistry*.

TESTING CLAUSE, in a Scotch deed, is the last clause, which narrates when and where the parties signed the deed, before what witnesses, the number of pages of which the deed consists, and who was the person who penned the deed. Moreover, if there have been any interlinations or erasures of important words during the engrossing, these should be mentioned in this clause. The clause is an essential part of a Scotch deed, and no deed which is written by another than the party is valid unless the testing clause is regular. The usual form is this: "In witness whereof, these presents, written on this and the five preceding pages by John Smith, residing at, etc., were subscribed by the parties as follows—viz., by the said A. B. at Glasgow on the 26th day of June, 1874, before these witnesses, W. X. of, etc., and Y. Z. of, etc."—In English or Irish deeds there is no necessity to enumerate these particulars in the attestation clause.

TEST-PAPERS are made by dipping unsized paper, into an alcoholic solution of a vegetable coloring matter which changes color when exposed to the action of an acid or alkaline solution. The paper, after being gently dried, is cut into slips of a suitable size. Hence, by dipping the appropriate test-papers into any solution, we can ascertain whether it is acid, alkaline, or neutral. Litmus and turmeric are most commonly used as the coloring matters; litmus for the detection of acids, and turmeric for that of alkalis.

TESTUDO. See TORTOISE.

TESTUDO, in ancient warfare, was a defensive arrangement of the shields, by means of which a body of men advancing against a wall for assault or mining sought to protect themselves from the darts and weapons of the defenders. The men standing in close order joined their shields above their heads, the edges overlapping, until the whole resembled the shell of a tortoise (*testudo*).—The name was also applied to a machine moving on wheels, and roofed over, under which soldiers worked in undermining or otherwise destroying the walls in a siege. See BATTERING-RAM.

TETANUS (derived from the Gr. *teinein*, to stretch), is one of the most formidable diseases of the nervous system, and is characterized by an involuntary, persistent, intense, and painful contraction or cramp (see SPASM) of more or less extensive groups of the voluntary muscles, nearly the whole of the body being sometimes affected. There is usually a certain degree of order in which the different sets of muscles are affected. The muscles of the neck, jaws, and throat are almost always the first to give evidence of the presence of the disease. "The patient," says Dr. Watson, who has written a most graphic description of this terrible malady, "feels a difficulty and uneasiness in bending or turning his head, and supposes that he has got what is called a stiff neck. He finds also that he is unable to open his mouth with the customary facility. At length the jaws close; sometimes gradually, but with great firmness; sometimes (it is said) suddenly and with a snap. In four cases, perhaps, out of five, the disease begins in this way with

trismus or *lock-jaw*; so that this last is the vulgar name for the complaint. Along with this symptom, or very soon after it, the muscles concerned in swallowing become affected; and in a short time there comes on, what is often the most distressing part of the disorder, an acute pain at the lower part of the sternum, piercing through to the back. This pain depends, it can scarcely be doubted, upon cramp of the diaphragm, and is subject to aggravation in paroxysms. The spasm extends to the muscles of the *trunk*; to the large muscles of the extremities; the muscles of the *face*; and last of all, in general to the muscles of the tongue, and of the hands and fingers, which often remain movable at the will of the patient, after all the other voluntary muscles of the body have become fixed.”—*Lectures on the Principles and Practice of Physics*, 4th ed., vol. i. p. 568. The muscles that are affected remain permanently contracted till either recovery or death ensues, and some of them, as, for example, the muscles of the abdomen, are so rigid, as when struck by the fingers, to resemble a board, although a perfect remission of the spasm scarcely ever occurs, except sometimes during sleep. Exacerbations of the spasms, on the other hand, commonly occur every ten minutes or quarter of an hour, usually beginning by an increase of the pain at the sternum, and lasting for two or three minutes; and as the disease advances, these paroxysms become more frequent. The powerful muscles of the back generally overcome the muscles in the front of the body, and when this excess of morbid power in the back is marked, the result is that the patient during the paroxysms rests solely on his head and heels, while his body is raised in an arched form. Occasionally the muscular contraction predominates in the opposite direction, and brings the head and knees in contact; and still more rarely, the body is bent to one side.

During the exacerbations, the face of the patient often presents a positively frightful appearance. The tongue is apt to get bitten during the contractions, which are occasionally so violent as to break the teeth, rupture powerful muscles, and at least in one case, to fracture the thigh-bone. Death usually results from a mixture of causes, but mainly from apnoea (breathlessness), due to the fixed condition of the respiratory muscles, associated with asthenia (loss of power), and flagging of the heart's action.

There are two principal causes of this disease, viz. (1) exposure to cold and damp, and (2) bodily injuries. When tetanus arises from the *first* of these causes, it is termed *idiopathic*; and when from the second, *traumatic*. Idiopathic tetanus is so rare, at all events in this country, that we may pass on at once to the consideration of the traumatic variety. The disease is liable to follow any kind of injury, from a trifling cut or scratch to a compound fracture or the most severe operation, and is much more common in tropical than in temperate climates. The following table, given by Mr. Poland in his article “Tetanus” in Holmes's *System of Surgery*, vol. i. p. 306, gives the relative proportions which the occurrence of tetanus bears to various classes of surgical lesions observed at Guy's hospital during seven years:

There were of—

Major and minor operations.....	1364	cases—tetanus occurred in	1
Wounds of all varieties.....	594	“ “ “	9
Injuries and contusions.....	856	“ “ “	1
Burns and scalds.....	458	“ “ “	3
Compound fractures.....	396	“ “ “	9
Total.....	3668		23

From the large experience thus afforded, it appears that tetanus is most frequently met with in the more severe varieties of injury and accident, such as compound fractures, burns, and injuries to the fingers and toes. It is still a disputed point, whether the seat of the injury forms any special connection with the disease. Hennen, one of our greatest authorities on military surgery, observed it oftener after wounds of the elbow and knee; others, again, more frequently from injuries of the thumb and great toe. There is certainly a popular belief that wounds of the ball of the thumb are especially likely to be followed by tetanus.

The interval between the reception of the injury and the first tetanic symptoms commonly varies from the 4th to the 14th day, and rarely exceeds 22 days, some time in the second week being the most common period. As a general rule, the more rapidly the disease comes on, the more fatal will be the result.

More *trismus* or lock-jaw may be induced by affections of the teeth, especially by difficult dentition of the wisdom-teeth; but this is a purely local affection, in which the muscular contraction, though persistent, is never increased by painful spasmodic paroxysms, and which usually disappears on the removal of the exciting cause; and the general knowledge of this fact may tend to remove unnecessary terrors. Hysteria sometimes mimics the phenomena of tetanus with marvelous fidelity; and hydrophobia and tetanus have been mistaken for one another, in consequence of the spasm of tetanus sometimes affecting the muscles of deglutition, and inducing a fear of swallowing. There is, however, seldom any serious difficulty in detecting the difference between tetanus and any other disease. But there is a form of poisoning which produces almost every symptom of tetanus, and which may be termed *artificial tetanus*. If strychnia or brucia, or their salts, or vegetable matter containing either or both of these alkaloids, as *nux vomica*,

St. Ignatius's beans, or the juice of the upas tiente, be administered, either by the stomach or by inoculation, into the system, it induces all the symptoms of intense tetanus, and there is no test by which to distinguish the results of the disease and of the poisoning, except that, according to Dr. Christison, the disease never proves so quickly fatal as the rapid cases of poisoning with strychnia. See *NUX VOMICA*. And those who wish to study more minutely the comparative symptoms of strychnia-poisoning and tetanus, may consult the authorized *Report of Palmer's Trial*.

In the way of treatment, almost every known medicine has been prescribed, and whatever plan be adopted, a vast majority of the cases terminate fatally. As is the case with certain fevers, so tetanus seems to have a definite course to run; and as Mr. Poland wisely suggests: "All we can do is to enable our patient to weather out the storm by giving him as much strength as possible, and not adding fuel to the fire by all sorts of applications and internal remedies, which have over and over again signally failed. If we can help our patient on one day after another, we gain much: constant watching and constant attention are required by night as well as by day; an unflinching perseverance on the part of the sufferer in carrying out these views; besides the avoidance of all causes of excitement, and more especially the cold air or winds; taking care to preserve a uniform temperature as much as possible." When, in consequence of the strong contraction of the muscles of the jaw, it is impossible to open the patient's mouth, food and physic should be introduced into the stomach by means of a flexible tube passed through one of the nostrils.

The peculiar form of tetanus that occurs in newly-born children differs in so many respects from the disease described in this article that we shall briefly notice it in a separate article under the title of *TRISMUS NASCENTIUM*.

TETANUS, or **LOCK-JAW**, occurs in most of the domesticated animals, but most frequently in horses and sheep. It is usually produced by cold and wet, by intestinal worms, obstinate constipation, or injuries. The symptoms usually come on gradually, involve tolerably equally most of the muscular structures, which become hard and rigid; the nose is protruded, the limbs move stiffly, the tail is upraised, the bowels are constipated. The patient must be kept perfectly quiet, and in an airy but tolerably warm place, and plentifully supplied with cold water, and with soft, sloppy, but tolerably nutritive food, which he will usually greedily suck in through his firmly-closed teeth. A full dose of purgative medicine must at once be given; extract of belladonna repeated twice or thrice daily is occasionally serviceable; any discoverable wound or injury should be fomented or poulticed; bleeding, sedatives, and all causes of irritation must be avoided. In adult animals most cases are fatal; but among young animals, especially when the attack results from exposure to cold, many recoveries occur.

TÊTE-DU-PONT. See *BRIDGE-HEAD*.

TETRAGONIA CÆÆ, a natural order of exogenous plants, formerly included in *mesembryaceæ* (q.v.), from which it differs chiefly in the want of petals. The species are herbaceous plants or small shrubs, with alternate, thick, succulent leaves. A few are found on the shores of the Mediterranean, and some in Asia and the South Sea islands, but the order abounds chiefly in the s. of Africa. New Zealand spinach (q.v.) belongs to this order. Other species are also used like spinach, as *sesuvium portulacastrum* and *S. repens* in the West Indies. Species of *aiyoon* are among the plants burned for barilla in Spain and the Canary isles.

TETRAHEDRON (Gr. *tettares*, four, *hedra*, a side), one of the five regular geometric solids, is a solid bounded by four equilateral triangles. The best idea of it is gained by considering it as a triangular pyramid, whose three sides and base are equilateral (and therefore equal) triangles. It is a form assumed by some crystals, and in crystallography is considered as a secondary form of the octahedron (q.v.), produced by removing the alternate angles or edges of the latter.

TE TRAO AND TETRAONIDÆ. See *GROUSE*.

TETRAPOLITAN CONFESSION, the creed of a body of Lutherans who held the doctrine of Carlstadt and of Zwingli concerning the Lord's-supper. It was drawn up by Bucer, 1531, was defended by Capito, and presented at the diet of Augsburg. The four cities which gave it a name—Constance, Strasbourg, Memmingen, and Lindau—held to it for many years.

TETRARCH (Gr. *tetrarches*, Lat. *tetrarcha*, "governor of the fourth part," i.e., of a country), a title originally designating what is signified by its etymology, the governor of one of four divisions of a kingdom or country; but, in the usage of the later Roman empire, given undistinguishingly to all minor rulers, especially in the east, possessing sovereign rights within their territory, but dependent on the emperor, and in many cases removable at his pleasure. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke iii. 1) and by that of king (Matt. xiv. 9). The tetrarch in this latter sense was in truth a sovereign, although a dependent sovereign; and there are instances in which it seems to have been applied to really independent sovereigns of small principalities.

TETTER, the popular name for skin diseases of the kind described under *PSORIASIS* and *HERPES*.

TETUAN, a sea-port t. and small province on the n. coast of Africa, 22 m. s. of Ceuta, and 40 m. s. of Gibraltar. Area, 914 sq. m.; pop. 17,600. It is surrounded by walls, flanked with towers, and is defended by a castle. Its harbor does not admit large vessels; but a brisk trade is carried on in wool, silk, girdles, leather, cotton, etc., and it exports provisions largely to Ceuta. Oranges are grown in great abundance in the vicinity, and are exported to Spain, Gibraltar, Oran, and recently to England. Tetuan was taken by the Spaniards under O'Donnell (q. v.), Feb., 1860, but was evacuated next year. In 1873, 211 vessels, of 2,716 tons burden, entered the port of Tetuan.

TETZEL, or **TEZEL** (properly *Diez* or *Diezel*), JOHN, well known in connection with the controversy regarding indulgences, out of which the first beginnings of the reformation took their rise, was b. at Leipsic between 1450 and 1460. His father was a goldsmith of that city. Tetzel, after completing the ordinary studies of the period in the university, entered the Dominican convent of St. Paul in 1489, and soon established a reputation as a popular and effective preacher. His personal character is a subject of much controversy. The questions as to the teaching of Tetzel are more important. His ability and success as a preacher led to his being intrusted with the charge of preaching an indulgence, first on behalf of the Teutonic knights, and afterward, in 1516, on the far more momentous occasion of the celebrated indulgence published in favor of contributors to the fund for building the church of St. Peter's at Rome. In the discharge of this commission it cannot be doubted that Tetzel went to extremes which it is impossible to justify; but the worst charges, and especially that of preaching the efficacy of indulgences without repentance, and of offering anticipatory pardons for future sin, are strongly denied by Roman Catholic writers as being contradicted not only by contemporary authorities, but also by the very instructions contained in his official commission. Much of the obloquy which he drew upon his cause was produced by the pomp and apparent luxury in which he traveled about upon his mission. It was in opposition to the preaching of Tetzel that Martin Luther published his celebrated theses, on Oct. 31, 1517. Tetzel replied first by publicly burning these obnoxious propositions; but he afterward published a series of counter-theses (which were burned in retaliation by the students of the university of Wittenberg); and in May, 1518, a detailed reply to Luther's celebrated sermon on indulgences. On the arrival of the papal delegate Miltitz, Tetzel addressed to him a letter in reply to the charges of his adversaries; but, notwithstanding this defense of his conduct, he was summoned to appear before Miltitz in Leipsic in the January of the following year, and underwent a severe rebuke for the excesses in language and the improprieties in proceeding which had brought so much scandal upon the church. Miltitz threatened him, moreover, with the severest animadversions on the part of the pope. He was required in consequence to withdraw to his convent at Leipsic, where he died in the August of the same year, 1519, according to some of the plague, but according to another account, of the chagrin and mortification resulting from the judgment of the papal representative.—See, on the one side, Hechlein, *Vita Tetzelii*; Hofmann, *Lebensbeschreibung des Ablass-predigers Dr. Joh. Tetzel* (Leip. 1844); and on the other, Schrödl, in *Wetzer's Kirchen-Lexicon*, art. "Tetzel," x. 767.

TEUCER, the name of two kings in ancient legend. The first, living in the Troad, whose people were called after him, Teucri, was the son, according to the mythologists, of the river-god Scamander and Ideia. He married his daughter Batea to Dardanus of Samothrace, who was his successor, and the founder of Dardania. The second Teucer was the son of Telamon, king of Salamis, and Hesione, daughter of Laomedon. He came with the Greeks to the Trojan war, on his return from which his father would not allow him to land at Salamis because he had not avenged the death of his brother Ajax. Teucer sailed for Cyprus, where he founded another Salamis.

TEUTOBURGER WALD (Lat. *Teutobergensis Saltus*). See HERMANN.

TEUTONIC, a term applied to a group of nations as well as of languages, forming an important division or stem of the Aryan (q. v.) family. The Teutonic languages will be found enumerated and classified in the table at the end of the article PHRLOGOY. The Teutonic stock of nations, as they exist at the present day, is divided into two principal branches: (1) The Scandinavian, embracing Danes, Swedes, Norwegians, Icelanders; and (2) the Germanic, which includes, besides the German-speaking inhabitants of Germany proper (see GERMAN) and Switzerland (q. v.), also the population of the Netherlands (the Dutch), the Flemings of Belgium, and the descendants of the Anglo-Saxons in Great Britain, together with their offspring in North America, Australia, and other British colonies. It is necessary in this case, as in all similar cases, to guard against making language the sole test of race. In many parts of Germany where German now prevails, Slavic dialects were spoken down to recent times, and in some places are not yet quite extinct. And in Great Britain it is unreasonable to suppose that the Anglo-Saxon invaders exterminated the native Celtic population, or even drove more than a tithe of them into the Highlands. The mass undoubtedly remained as subject serfs, learned the language and customs of their masters, and gradually amalgamated with them; so that, in point of blood, the English are perhaps as much Celtic as Teutonic.

Of the various tribes and nations spoken of as inhabiting northern Europe in ancient times, it is often difficult to determine which were really of Germanic race, and which Celtic or Slavic; the classic writers, having no skill in detecting the affinities of lan-

guage, had only confused notions of ethnology. Of undoubted German nations who took part in the destruction of the Roman empire, the most prominent were the Goths (q.v.), Lombards (q.v.), Vandals (q.v.), and Franks (q.v.). The term Teutonic is derived from *Teutones*, the name of a nation or tribe first mentioned by Pytheas, who wrote about 320 B.C., as then inhabiting a part of the Cimbric Chersonesus, or Jutland. For the next 200 years there is no further mention of the Teutones, that is, not until 113 B.C., when they appear in history as ravaging Gaul, and in conjunction with the Cimbri and Ambrones, threatening the very existence of the Roman republic. The Cimbri having gone into Spain, the Teutones and Ambrones were at length defeated by C. Marius in a great battle at Aquæ Sextiæ, or Aix, in Gaul, 102 B.C., in which from 100,000 to 200,000 of the invading army were slain, and many thousands made prisoners. A similar victory was gained by Marius in the following year over the Cimbri in the plains of Lombardy. It is disputed among ethnologists and historians whether the Cimbri so defeated were of the Celtic or of the Germanic race, and doubts have even been thrown on the claim of the Teutones to be considered Germans, although the best German scholars hold the claim to be established. Be that as it may, Roman writers, after the time of Cæsar and Tacitus, began to use the adjective Teutonicus as equivalent to Germanicus; and this practice was adopted in the middle ages by Germans writing in Latin. The native term was *theodisk*, from Goth., *thiud*, people; and it is from this word, and not from Teutonic, that the modern *Deutsch* is derived. See GERMANY.

TEUTONIC KNIGHTS, one of the more celebrated of the military and religious orders to which the crusades gave birth. The sufferings of the Christian soldiers at the siege of Acre excited the sympathy of certain merchants of Bremen and Lübeck, who rendered such important services by the erection of hospitals and otherwise, that duke Frederick of Swabia, with the sanction of pope Clement III. and the emperor Henry VI., enrolled them in an order of knighthood, as the Teutonic knights of St. Mary of Jerusalem. Only Germans of noble birth were made admissible to the order, the original founders having probably been ennobled before being enrolled. The members were at first all laymen, but priests were soon admitted as chaplains; and there was also added about 1221 a class of half-brothers similar to the serving-brothers of the Templars and Hospitalers. The habit of the order was a white mantle with a black cross; and the knights took vows of poverty and chastity, which in later times were not very strictly interpreted. Their first seat was Acre. On the overthrow of the kingdom of Jerusalem, the grand master removed to Venice, and from thence in 1309 to Marienburg, on the banks of the Vistula. In 1237, this order became united with the Brethren of the Sword in Livonia. In the course of the 13th c., the Teutonic knights were, with the sanction of the pope, engaged in a bloody war to enforce Christianity on the heathen nations inhabiting the southern shores of the Baltic, which resulted in the acquisition by the order of Prussia, Livonia, Courland, and other adjoining territories. Warriors from all parts of Europe in that and the following century joined their standard, including Henry IV. of England, accompanied by 300 attendant knights and men-at-arms. The conquests of the order raised it to the rank of a sovereign power, with a territory extending from the Oder to the Baltic, and embracing a population of between two and three millions, the grand master having his seat at Marienburg in Prussia. The decline of the order began in the 15th c., and its fall was brought about partly by internal dissensions, and partly by the attacks of neighboring states. Sigismund of Poland wrested w. Prussia from the knights; and Albert of Brandenburg, who was chosen grand master in hopes of his aiding the order against Poland, ended an unsuccessful war with Sigismund by an arrangement, according to which the territories of the order in e. Prussia were formed into a duchy, to be held by Albert and his successors. Mergentheim in Swabia then became the seat of the grand master, who was recognized as a spiritual prince of the empire. At the peace of Preburg in 1805, the emperor of Austria obtained the rights and revenues of the grand master; but in 1809 the order was abolished by Napoleon, its lands passing to the sovereigns in whose dominions they lay. The Teutonic order, however, still continues to preserve a titular existence in Austria.

TEVFIK I. See KHEDIVE.

TWICKESBURY, an ancient market-t. and parliamentary and municipal borough of Gloucestershire, in the vale of Evesham, on the Avon, and near its confluence with the Severn, 10 m. n.e. of Gloucester. The parish church, an ancient and noble edifice in Norman, is the most noteworthy architectural feature. Hosiery, shoes, nails, leather, and malt are manufactured, and there is an extensive carrying trade, of which Twickesbury is the center, on the Avon and Severn; pop. '71, 5,409. Twickesbury, a very ancient town, appears to be of Saxon origin. Within half a mile of it was fought (May 14, 1471) the famous battle of Twickesbury, in which the Yorkists under Edward IV. and Richard III. inflicted a signal defeat on the Lancastrians.

TEXAS, one of the south-western states of America, is bounded on the s.w. by Mexico, from which it is separated by the Rio Grande; and on the e. by Arkansas and Louisiana. Area (greater than any other state or territory but Alaska), 274,356 sq. miles. Pop. '60, 601,039; '70, 818,579. It is divided into 174 counties. Among the chief towns are Austin, the capital; Galveston, the principal seaport; San Antonio, Houston, Brownsville, and Jefferson. Nearly the whole gulf coast is lined with bays, generally

long and narrow, with shallow inlets—that of Galveston being 12 feet. The chief rivers are the Red river, which separates Texas from the Indian territory; the Sabine, Trinity, Colorado, and Rio Grande. These rivers, mostly navigable from 300 to 400 m., run s.e., nearly parallel to each other, and empty into the gulf of Mexico. The country on the coast of the gulf is level, with a gradual ascent, the middle region undulating with rolling prairies; the w. is a high table-land, and the salt plains and staked plains (*el llano estacado*) on the borders of Arizona, are deserts 3,000 to 4,000 ft. above the sea, without trees, and in the summer without grass. There are a few small mountains in the west—spurs of the Rocky mountains. The river-bottoms are well timbered. In eastern Texas, wooded lands, called cross-timbers, alternate with prairies, and the country has a park-like and delightful aspect. The coast-region is formed of alluvial beds of sand or gravel; the middle, of outcrops of tertiary formations. In some places, petroleum is found on the surface of acid springs, and the earth is so charged with bitumen as to be used for fuel. There are fertilizing marls and gypsums, brown coal or lignite in beds of 6 in. to 8 ft., and beds of hematite. Beyond the tertiary lies a wide range of cretaceous formations, beds of limestone, sandstone, clays, marls, and beyond these, 5,000 sq.m. of coal-measures, four distinct seams, of 8 or 9 ft. in all, resting on fire-clay. There are also fine marbles, and some deposits of lead and copper. The soil is of great fertility, the coast producing the finest cotton, sugar, etc.; and the interior, wheat, Indian corn, tobacco, fruits of all kinds, with abundant pasture—making it one of the finest cattle-countries in the world. The climate is pure, temperate, and remarkably salubrious. The thermometer ranges from an average of 84° F., the hottest month in summer, to 50°, the coldest month in winter. The eastern region is rainy; the middle, moderate; the south-western, dry. The vegetation is in the greatest variety, from the oak, cedar, and pine, to the palmetto, muskeet, and nopal, which feeds the cochineal insect, with figs, oranges, grapes, vanilla, and flowers in wonderful profusion. The prairies abound in buffalo, immense herds of wild horses, and the forest with deer. There are also the puma, jaguar, black bear, wolf, etc. The coasts, bays, and rivers abound in the finest fish, shell-fish, turtles, etc. Though the country is generally level, it is not destitute of wild and grand scenery. In some places are found gigantic animal fossils and silicified trees. In 1870 there were 2,964,836 acres under cultivation, producing 20,554,538 bush. of Indian corn, 415,142 bush. of wheat, etc. The live-stock included, in 1873, 718,247 horses, 3,175,682 cattle, and 1,476,844 sheep. In 1870 there were in all 2,399 manufacturing establishments in Texas. There is a large trade with Mexico, and by the Red river and gulf with New Orleans. The chief exports are cotton, sugar, tobacco, cattle, and wool. The state deaf and dumb, orphan, blind, and lunatic asylums have each an endowment of 100,000 acres of state lands. In 1874 there were 2,129 public schools in Texas, and there is a state school-fund of \$2,637,673. The value of assessed property in 1875 was \$241,841,860. In 1872 there were 916 m. of railway completed; in 1875, 1572 miles.

La Salle, the French explorer, erected a fort on Matagorda bay, 1687. A Spanish settlement and mission was formed in 1690, but soon abandoned. In 1715 the country was settled by the Spaniards, under the name of New Philippines, and several missions established; but the Comanche and Apache Indians, among the most warlike in America, and still the terror of the border settlements, hindered the progress of the country. In 1803, when Louisiana was ceded by France to the United States, Texas, claimed by both Spain and the United States, became a disputed territory. From 1806 to 1816, settlements were formed, and several attempts made to wrest the country from Spain. In one of these, in 1813, 2,500 Americans and Mexicans were killed, and 700 inhabitants of San Antonio. Mina, a Spanish refugee, gained some successes, but was defeated and shot. Lafitte, a gulf pirate, made a settlement at Galveston in 1815, but it was broken up in 1821. In 1819 the river Sabine was established as the boundary. In 1820 Moses Austin, an American, got a large grant of lands in Texas from the Mexican government, and began a settlement, which rapidly increased; but many of the settlers were of so lawless a character that, in 1830, the government forbade any more Americans coming into Texas. In 1833 a convention of settlers, now 20,000 in number, made an unsuccessful attempt to form an independent Mexican state; and in 1835, a provisional government was formed, Sam Houston (q.v.) chosen commander-in-chief, and the Mexicans driven out of Texas. Santa Anna, president of Mexico, invading the country with an army of 7,500, after some successes, was entirely routed at San Jacinto, April 21; and Texas became an independent republic, acknowledged, 1837, by the United States, and in 1840 by England, France, and Belgium. In Dec., 1845, Texas was annexed to the United States, but was invaded by Mexico, which had never acknowledged its independence, and thus originated the war with the United States. In Feb., 1861, Texas joined the secession. Not till 1870 was the state readmitted to representation in congress, and regular civil government restored. In 1876 a new constitution was adopted by the vote of the people.

TEXAS (*ante*) may be divided into four sections, eastern, central or middle, western, and northern Texas. The first embraces the territory between the Sabine and Trinity rivers and is the great lumber region of the state. The soil of the uplands of this portion has a light, loamy texture on a basis of red or yellow clay; in the valleys it

is generally a deep vegetable mold or alluvium, very rich and productive. The second division lies between the Trinity and Colorado rivers and contains a large portion of the wheat lands of the state and extensive prairies. The western part includes a vast territory from the Colorado to the Rio Grande river, about four-fifths of which is prairie land and used extensively for stock raising. The northern division contains the four counties s. of Red river, is about equally divided between prairie and forest, and has a yellow, loamy, sandy soil. The principal geological formations are the alluvial, tertiary, cretaceous, and carboniferous. The alluvial extends along the gulf coast; back of this is the tertiary, having its widest expansion in the east; next, in the n.w. is the cretaceous, extending w. on Red river and s. to San Antonio. The carboniferous formation extends through the counties w. of Cooke county to the "staked plain," stretching s. from Red river to and beyond the upper Colorado. Copper is the most abundant metallic product, and a belt of the ore extends from the Red river and the counties of Clay, Archer, etc., across to the Rio Grande through Pecos and Presidio counties. Iron, lead, silver, and bismuth are also known to exist in the interior of the state. The large coal-field, mentioned above, is an outlying spur of the great Missouri coal-field, and yields a bituminous coal having 52 per cent of fixed carbon. A smaller coal-field in Brown, Coleman, Comanche, and Hamilton counties is anthracite or semi-anthracite of good quality. In the n.w. salt springs and salt lakes are numerous, and along the gulf shore, especially south-westward, there are extensive and productive salt lagoons. Potter's and fire clays, marble, roofing-slate, grindstones, soapstones, feldspar, alum, antimony, arsenic, mineral oils and pigments, marls and other fertilizers, are found in great quantities here and there. The soil, of which they are three or four varieties, is in general very fertile. The stiff, black soil of the river bottoms is fittest for sugar and cotton, though the latter grows well on the prairies and uplands; the finer black or chocolate colored soil of the prairie lands yields abundant crops of corn and the cereals, and the lighter copper colored soil of the uplands is well adapted for the grasses and fruits; while the fine silt of the islands produces the best sea-island cotton known. The soil of the desert tracts of the n.w. is sandy and charged with carbonate of soda and other alkalies, which when irrigated produces moderate quantities of grasses and herbage. The principal forest trees, of some of which several species occur, are the oak, elm, maple, hickory, pecan, sycamore, magnolia, willow pine, cypress, mulberry, cedar, sweet gum, ash, walnut, palmetto, cottonwood, and mezquite. The n. and n.w. has a temperate climate, and the gulf coast a semi-tropical. In the northern parts of the state wheat, barley, oats, corn, and cotton are the staple products, while sweet and Irish potatoes and other vegetables common in temperate climates are raised to considerable extent. Apples, pears, peaches, plums, grapes, and strawberries are also cultivated. Along the gulf the orange, lemon, olive, fig, and other semi-tropical fruits thrive. Sugar cane is raised in this region in profitable quantities, and also rice. Tobacco is cultivated to some extent both at the n. and south.

The most populous portions of the state are the eastern and central parts. In 1870 there were few inhabitants w. of the 100th meridian, except along the Rio Grande. Of the total population 756,168 persons were natives and 62,411 of foreign birth. The most of the foreigners were natives of Germany, England, or France. At that time 227,126 persons, 10 years old and upward were engaged in occupations, of which 166,753 were employed in agriculture, 40,882 in professional pursuits, 13,612 in trade and transportation, and 15,879 in manufactures and mining. By the last census, 1880, the total pop. is 1,592,574, showing a gain during the past 10 years of over 700,000. Those born in the United States number 1,478,053; in foreign countries, 114,516; those that are white, 1,197,499, the colored, 394,001. Within the past five or six years the state has been growing in popularity with emigrants, and has multiplied in prosperity in many ways. The only definite statistics at present obtainable, however, further than given, are those of 1870. The crops for that year were 66,173 bushels of spring wheat, 348,939 of winter wheat, 20,554,538 of Indian corn, 762,663 of oats, 44,351 of barley, 28,521 of rye, 44 of buckwheat, 42,654 of peas and beans, 208,383 of Irish potatoes, 2,188,041 of sweet potatoes, 7 of clover seed, 497 of grass seed, 2 of flax seed, 63,844 lbs. of rice, 59,706 of tobacco, 1,251,328 of wool, 3,712,747 of butter, 34,342 of cheese, 51 of hops, 25 of flax, 13,255 of wax, 275,169 of honey, 6,216 gallons of wine, 5,032 of maple molasses, 174,509 of sorghum molasses, 246,062 of cane molasses, 2,020 hogsheads of cane sugar, 5 tons of hemp, 18,982 of hay, and 350,628 bales of cotton. Of the manufactured products at that date the most important was lumber, there being 192 saw-mills, producing annually material valued at \$1,736,482. Next in importance and value were the packing establishments of beef and other meats, in fifteen of which packed meats, condensed meat essences, meat biscuits, etc. were put up to the value of \$1,052,156. Among the other manufactories were 4 cotton-mills that produced goods annually valued at \$375,000; 138 saddlery and harness establishments; 71 tin, copper, and sheet-iron ware factories; 115 carriage and wagon shops; 533 flouring and grist mills; and 12 establishments for the manufacture of agricultural implements. Altogether the capital invested amounted to about \$5,281,110; the wages paid, \$1,787,835; the value of raw material \$6,273,193; and the value of goods produced, \$11,517,302. The abundance of raw material, the water-power of the w. central region, and the high price of manufactured goods have stimulated these industries a great deal, and manufacturing since

1870 has made much progress. A large part of the state's trade is with Mexico, and the chief item of export is cotton. The ports of entry are Brownsville, Corpus Christi, El Paso, Indianola, and Galveston. For the year ending in June, 1875, the imports amounted to \$3,950,239; the exports of domestic products, \$17,193,118; the exports of foreign products, \$1,631,064. The principal railroads are the Houston and Texas Central, extending from Houston to Red river, 340 m.; the International, from Hearne to Longview, 174 m.; the Houston and Great Northern, from Houston to Palestine, 152 m.; the Galveston, Harrisburg and San Antonio, from Harrisburg to Columbus, 84 m.; the Texas Pacific, from Longview to Shreveport, La., 66 m.; and the Gulf, Houston and Henderson, from Galveston to Houston, 50 miles. The national banks in 1875 numbered 10, and the state banks 20.

In Feb., 1876, the bonded debt of the state was \$4,249,757 and the floating debt, \$543,137, making an aggregate of \$4,792,894. The receipts from all sources, including a balance in the treasury from Aug. 31, 1874, to the same date 1875, the close of the fiscal year, were \$2,800,075, and the disbursements for the same period were \$2,497,276, leaving a balance in the treasury of \$302,799.

The public schools of the state are under the control of a board of education composed of the governor, comptroller, and secretary of state. The permanent fund in 1875 amounted to \$2,637,673, and the constitution provides that one-fourth of the revenue from general taxation and a poll tax of \$1 shall be annually set aside for school purposes. In addition to these resources the Peabody fund paid in 1875 \$4,800 in aid of the public schools. The school population during that year in 145 counties was 331,400 children. Only 97 counties, however, made any definite report, in which the school population was 210,922. Of these 124,567 were enrolled in the schools, and the average daily attendance was reported to be 84,415. There were about 2,924 organized schools and 3,190 teachers employed. Among the collegiate institutions in the state at that date were Baylor university (Baptist), at Independence; Austin college (Presbyterian), at Huntsville; university of St. Mary (Roman Catholic), at Galveston; Soule university (M. E. south), at Chappell Hill; Trinity university (Cumberland Presbyterian), at Tolucaua; Henderson college (non-sect.), at Henderson; and Texas university (M. E. south), at Georgetown. Most of these schools have several departments and admit both sexes. The number of libraries in 1870 was 455 with 87,111 volumes, of which 135 with 25,018 volumes were public. The newspapers and periodicals published number about 120, of which 12 are daily, 89 weekly, and 1 semi-monthly. The religious organizations in 1870 were 275 Baptist, 18 Christian, 1 Congregational, 32 Episcopal, 1 Jewish, 23 Lutheran, 355 Methodist, 101 Presbyterian, and 36 Roman Catholic.

A new constitution, adopted Feb. 15, 1876, fixes the term of the governor and most of the executive officers at two years. The legislature meets biennially, and consists of a senate of 31 members and a house of representatives of 93 members. Judicial officers are elected and serve for limited terms. Voters must have resided one year in the state and six months in the district where the vote is cast; and if financial measures are voted upon, tax-payers alone are allowed to vote. By the apportionment of 1872 the state is entitled to six representatives in congress and eight electoral votes. The electoral votes have been cast as follows: 1848, Cass and Butler, 4; 1852, Pierce and King, 4; 1856, Buchanan and Breckenridge, 4; 1860, Breckridge and Lane, 4; 1864 and 1868 no vote was cast; 1872, Greeley and Brown, 8; 1876, Tilden and Hendricks, 8; 1880, Hancock and English, 8.

TEXAS, a co. in s. Missouri, drained by Current river, and the branches of the Gasconade river; about 1225 sq. m.; pop. '80, 12,219—12,024 of American birth. The surface is hilly and heavily wooded. The soil in the river valleys is rich. The principal productions are corn, wheat, tobacco, oats, wool, and cattle. Co. seat, Houston.

TEXAS CATTLE DISEASE, otherwise called Spanish fever, splenic fever, acclimation fever, American cattle plague, red water, black water, yellow murrain, and bloody murrain; a very fatal epizootic, contagious or infectious fever of cattle, confined to regions s. of the 37th parallel of n. latitude except when communicated by cattle brought from there. The earliest recorded account of the disease is in a lecture before the "Philadelphia Society for Promoting Agriculture" by Dr. James Meare, Nov. 3, 1814, and which is quoted in a report to the department of agriculture at Washington in 1871 on diseases of cattle in the United States by Mr. Dodge. It is there stated that cattle from certain districts in South Carolina were found to communicate the disease to those with which they mingle while being driven northward, and that a law was enacted by Virginia against their passing through that state. At the session of the general assembly of North Carolina in 1836-37, a law was passed to prevent cattle from entering that state from either South Carolina or Georgia between the first of April and the first of November. At the session of 1873-74 a new law was passed prohibiting the driving of cattle from South Carolina or Georgia into any of the counties w. of the Blue Ridge between the first day of April and the last day of November, and at the session of 1878-79 the former law was altered so as to prohibit the driving of cattle, not only from South Carolina and Georgia, but from any of the counties e. of the Blue Ridge, and also extending the prohibition to *all seasons of the year*. The greatest losses have been caused by driving Texas cattle through Arkansas, Missouri, and Kansas, and distributing them to feeders in vari-

ous western states. Missouri suffered much in this way as long ago as 1852 and 1853, and in the summers of 1856 and 1857 the states of Kansas and Iowa had great numbers of cattle swept away by the disease which was communicated by southern droves. In 1866 a drover brought a steamboat load of Texas cattle up the Mississippi and Ohio rivers, landing them at Louisville and driving them to Lexington, Ky., and all along the route of the drive nearly all the native cattle perished, and of a drove of fat cattle which followed them, all took the disease and died. In 1867 Cairo, Ill., became the chief point of transshipment of cattle coming from Texas and other places in the s., in consequence of their being prohibited from passing through Kansas, Missouri, and Iowa. During the early part of the season there was no trouble, but with the warm weather the disease made its appearance. In 1868 there was a great outbreak. Large numbers of cattle were brought into the state of Illinois. At the little town of Tolono, at the crossing of the Illinois Central and Toledo and Wabash railroads, from fifteen to eighteen thousand Texas cattle were landed, which by the first of September occasioned the death of nearly one thousand native cattle of the township, and five thousand in the county. Nearly two thousand cattle were carried off by the disease near Loda, Ill., and many others in different parts of the state. The losses in Warren co., Ind. alone were reported to be over fifteen hundred. At Cincinnati, Ohio, a herd of twenty-nine cows exposed to the contagion, all died, and similar experiences were repeated in other sections.

All observations indicate that in the permanently infected districts s. of parallel 37° the cattle become accustomed to the influence of the disease germs, and that the effect is much milder upon the organization, passing through it without creating much disturbance, and generally without being noticed. When, however, the southern cattle are taken into regions previously unaffected the native cattle, not being protected by previous habitual exposure, become the victims of the disease. The imported droves, also, when crowded, suffer to a certain extent, but not in comparison with the native cattle. Native cattle have been known to convey the disease to native cattle in other states, one instance being where native cows from Painesville, Ohio, brought the disease to Orange co., N. Y., causing the death of eight animals. *Symptoms.*—One of the first symptoms is an elevation of the animal temperature, which ranges usually from 106° to 108° Fahr. but occasionally not more than 104° to 105°, and sometimes as high as 110°. As death approaches the temperature falls to below the normal. The first outward symptoms are those of languor and fatigue, as drooping of the head, lopped ears, and arching of the back. The eyes are staring, the coat rough, the horns are hot and the nose dry. As the disease advances the head droops more, so that the nose almost reaches the ground; the hind legs are placed far under the body; the legs are very weak and the animal has a disposition to lie down, especially in water. The pulse is very frequent; sometimes soft and feeble, but often hard and wiry. The post mortem appearances are only to be seen soon after death, as decomposition rapidly sets in and speedily obliterates the pathological conditions. When soon enough examined the muscles have a dark red color, and the fat is of a deep brownish yellow, in some cases having a bronzed appearance. All the tissues, but particularly the muscles, have a peculiar sickening odor. On examining the alimentary canal the œsophagus and the first three stomachs have generally a not unnatural appearance, although the third stomach is often found dry and obstructed. In the fourth stomach there are characteristic changes. The whole mucous membrane is more or less congested, the cardiac portion especially, but the more peculiar lesions are at the pyloric end. It is not so much discolored, but is full of erosions, sloughs, and deep, excavated ulcers. The small intestines are the seat of congestions. Engorgements and extravasations of blood are common in the large intestines. The liver is usually enlarged, sometimes weighing from twenty to twenty-seven pounds, and fatty or waxy. The bile-ducts are injected with a yellowish-brown bile, and the gall bladder is almost always distended, with a dark, thick, flaky, and tarry looking bile, sometimes amounting to as much as four pounds. The kidneys are usually congested and enlarged, and the cortical substance softened. In a few cases they have a healthy appearance. The urinary bladder is generally distended with dark bloody urine, and the mucous membrane is frequently thickened and inflamed. The spleen is always enlarged, and engorged with dark colored blood. It is frequently softened, and in some cases is a mere pulpy, disorganized mass. It has been found two feet and a half long, and having a weight of over nine pounds. The lungs are generally healthy in appearance with the exception of small points of extravasation, and enlargement of some of the air-cells. The blood in the blood-vessels is nearly natural in appearance and coagulates quickly, but is generally rather more watery than in health. Dr. J. Cresson Sikes found that the white corpuscles were in excess only in one case, but the liquor sanguinis was yellower than in health, and contained minute flocculi of yellow granular matter. In some instances complete dissolution of the blood globules took place long before putrefaction. There is considerable difference of opinion as to the cause of the disease, and the nature of the infectious principle, but the general opinion is that it is owing to the development of a disease germ. The period of incubation varies. All observers agree that it is always as much as ten days, but it is often from two to six weeks, and even longer. It has been supposed by some that the period depends upon the amount of contagious matter present, but instances of the disease being propagated rapidly where cattle have been turned into pasture which had been but a short time occupied by only

a few imported cattle disproves this theory. Prof. Law of Cornell university, regards the virus as not being diffused in the atmosphere, but confined to the pastures on which the southern cattle graze, and he instances the fact that cattle may occupy a field adjacent to one in which southern cattle have grazed without taking the disease. In regard to extermination he regards the affection as of much less importance than pleuro-pneumonia (q.v.). The chief measures against the disease are those of prevention, and these consist in preventing the introduction of southern cattle during the spring and summer months, and the use of disinfectants in places where they have been harbored; but the efficacy of the latter is to great extent doubtful on account of the difficulty of thorough application. Considerable investigation is needed, and stringent measures of exclusion resorted to before satisfactory results can be attained.

TEXEL, THE, an island in the province of n. Holland, separated from the Helder by a narrow strait, called the Marsdiep, contains about 35,000 acres of arable and pasture lands, and has a pop. of 6,408. Many sheep are kept, producing fine wool. Fishing, ship-building, grinding corn, etc., are also sources of prosperity. There is much wealth in the island, but recently no steamboat communication existed with the mainland. The northern part is called Eijerland, or the egg-country, immense flocks of birds coming thither from Scandinavia to deposit their eggs.

TEXTILE FABRICS. See WEAVING.

TEZCU CO (i.e., "place of detention"), an ancient and much decayed city of Mexico, stands on the e. shore of the lake of the same name in the state, and 16 m. n.e. of the city of Mexico. In former times it was the capital of a great state, and was the second city in Mexico. During the early part of the 15th c. the city rose to its greatest splendor. It then contained ranges of stately mansions, in which the nobles resided, and a magnificent and vast pile of buildings, which served as the royal residence and as public offices. Tezcuco is now a poor place, filled with heaps of rubbish and ruins, and containing only 5,000 inhabitants.

THACHER, JAMES, 1754-1844; b. Mass.; served as surgeon's mate in the revolution to Dr. John Warren, at the hospital in Cambridge, Mass., 1778; chief surgeon to the 1st Virginia regiment in 1779; and later to a New England regiment. He settled in Plymouth, Mass., in 1783, as a physician, and became interested in the manufacture of salt and iron. He published various medical works; also agricultural and historical books.

THACHER, PETER, D.D., 1752-1802; b. Mass.; graduated Harvard college, 1769; ordained minister of Malden, 1770; wrote *Narrative of the Battle of Bunker Hill*; was a delegate to the state constitutional convention of 1780; was often chaplain to the legislature; pastor of Brattle Street church, Boston, 1785, remaining until his death. He was distinguished for pulpit eloquence, receiving the name of the "silver-tongued Thacher." He was a member of the American academy of arts and sciences. He published 22 works, among which were *Observations on the State of the Clergy in New England*.

THACHER, THOMAS, 1620-78; b. England; came to Boston, 1635; studied under Dr. Chauncy; ordained minister of Weymouth, Mass., 1645; practiced medicine in Boston, 1661; became the first pastor of Old South church, 1670, and remained until his death. He published *A Brief Rule, etc., in Small-Pox and Measles*, the first medical treatise published in New England. He prepared a *Hebrew Lexicon*, which was not printed.

THACKERAY, ANNE ELIZABETH, b. England, 1842; daughter of William Makepeace. Besides many less pretentious books, she has written *The Story of Elizabeth* (1863); *Old Kensington* (1873); and *Miss Angel* (1876); all novels marked by delicate perception and considerable powers of description.

THACKERAY, WILLIAM MAKEPEACE, novelist and satirist, was b. at Calcutta in 1811. He was of a good old English family, represented about the middle of last century by Dr. Thackeray, an eminent scholar, and head-master of Harrow. His father was in the civil service of the East India co., and, dying young, he left his son a fortune of £20,000. The latter, when a boy seven years of age, was sent to England, and placed in the Charterhouse school, that ancient Carthusian foundation, which he loved to commemorate in his writings. He next went to Cambridge, but left the university without taking a degree. In 1831 he was at Weimar, and saw Goethe. His ambition was to become an artist, and he traveled over most of Europe, studying at Paris and Rome. His drawings were not without merit; they were quaint, picturesque, and truthful, but somehow they missed the bright touches of a master-hand. He next took to literature, beginning with rare patience and contentment at the lowest step of the ladder. Under the characteristic name of Michael Angelo Titmarsh, or that of Fitz-Boodle, he became a constant contributor to *Frazer's Magazine*, and wrote for it two of the best of his minor works, *The Great Hoggarty Diamond* and *Barry Lyndon*. The latter is the story of an Irish sharper, and is told with a spirit, variety of adventure, and humor worthy of Le Sage or Fielding. Under the pseudonym of Titmarsh he also published *The Paris Sketch-Book* (2 vols. 1840); *The Second Funeral of Napoleon*, and *Chronicle of the Drum* (1841); and the *Irish Sketch-Book* (2 vols., 1843). The greater part of Thackeray's fortune having been spent in foreign travel and unsuccessful speculations at home, he continued to work steadily at literature as a profession. He was never widely popular, but a few

good judges appreciated his keen wit, observation, and irony, and his command of a style singularly pure, clear, and unexaggerated. The establishment of *Punch* afforded a more congenial field for Thackeray, and *Snob Papers* and *Jeames's Diary* were hailed with delight by all readers. Their author's reputation was still more advanced by his novel of *Vanity Fair* (1846-48), published in monthly parts in the style of *Pickwick*, and illustrated by the novelist himself, or, as he expressed it, "illuminated with the author's own candles." During the progress of *Vanity Fair* appeared *Notes of a Journey from Cornhill to Grand Cairo*, being an account of a journey undertaken for the benefit of his health; also *Mrs. Perkins's Ball*, a short Christmas tale, and two works of a similar kind entitled *Our Street*, and *Doctor Birch and his Young Friends*. In 1849 he began a second serial fiction, *Pendennis*, in which much of his own history and experiences are recorded. Next followed *Rebecca and Rowena* (1850), and *The Kickleburys on the Rhine* (1851). The latter work was sharply criticised by the *Times*, and Thackeray replied in a caustic and humorous *Essay on Thunder and Small Beer*, prefixed to a second edition of the satirical sketch. In 1851 the indefatigable novelist delivered a course of lectures on the *English Humorists of the Eighteenth Century*—light, graceful, discriminating sketches, with passages of real power and eloquence. In 1852-55 appeared two more novels, the most richly imaginative and highly finished of his works, *Esmond* and *The Newcomes*. These were followed by *The Virginians* (a much inferior novel), by *Lectures on the Four Georges* (first delivered in America), by *Lovel the Widower* and *Philip* (two short tales of somewhat coarse texture), and by a series of pleasant gossiping essays, entitled *Roundabout Papers*. These originally appeared in the *Cornhill Magazine*, of which Thackeray was for a time editor; and in the same miscellany he had begun and published part of a new novel, *Dennis Duval*, which promised to be one of the most carefully elaborated and successful of his works of fiction. He contemplated also *Memoirs of the Reign of Queen Anne*, which would have served as a continuation to Macaulay's *History*. He knew that period well, from his previous studies for *Esmond*, and as a moral anatomist and master of English he stood unrivaled. But, alas! such dreams and anticipations were suddenly dispelled. To the grief of all lovers of genius and of manly and noble character, Thackeray was cut off in the fullness of his powers in his 53d year, dying alone and unseen in his chamber before daybreak on the morning of Dec. 24, 1863. His medical attendants found that death was caused by effusion on the brain, and that his brain was one of the largest, weighing no less than 58½ ounces.

In his delineation of the character and genius of Fielding, Thackeray has drawn his own. He had the same hatred of all meanness, cant, and knavery, the same large sympathy, relish of life, thoughtful humor, keen insight, delicate irony, and wit. There was, however, one personal difference: Fielding was utterly careless as to censure of his works, whereas his successor was tremblingly alive to criticism, and was wounded to the quick by the slightest attack. His morbidly delicate organization made him exquisitely susceptible of either pain or pleasure. He had suffered much from physical maladies and from domestic calamity; and his earlier works, especially his *Vanity Fair*, were tinged with a degree of cynicism which seemed to countenance the charge of his unfriendly critics, that he delighted in representing the baser side of human nature, and was skeptical as to the existence of real virtue in the world. His strength lay in portraying character rather than inventing incidents; and in Becky Sharp, col. Newcome, Harry Foker, Laura Pendennis, and Paul de Florac, to say nothing of the picaresque, Barry Lyndon, he has left us a living gallery, certainly not surpassed by any modern novelist. In his later writings the dark shades no longer preponderate. The mellowing influence of years and sickness, and calmer as well as more extensive observation of life, had sunk the merciless satirist in the genial humorist and philosophic observer. He had still ample scorn for falsehood and vice, and satire for folly and pretense; but he had also smiles and tears, and tenderness and charity, that gave a moral beauty and interest to the last decade of his brilliant career as an author.

THAIS, an Athenian courtesan, famous for her wit and beauty, who was in Asia along with Alexander the great, and according to Cleitarchus—a doubtful authority—induced the Macedonian king, when excited with wine, to set fire to the palace of the Persian kings at Persepolis. After his death she lived with Ptolemy Lagi, by whom she became the mother of several children.

THALASSIDRO MA. See **PETREL**.

THALBERG, SIGISMUND, a very eminent pianist, b. at Geneva in 1812, received the greater part of his musical education at Vienna, where he was a pupil of Hummel. He made his first public appearance in 1827, and his *début* in Paris in 1835. After residing for a time in America he returned to Europe, and died April 27, 1871. In graceful and brilliant execution, and in manual dexterity on the piano, he had hardly a rival. His compositions are principally fantasias and variations.

THALEIA, or **THALIA** (Gr. the blooming one), one of the nine muses (q.v.), generally regarded as presiding over comedy. By Apollo, Thaleia became the mother of the Corybantes.

THALER, a coin in circulation in Germany, Austria, Holland, Belgium, Denmark, Sweden, and Norway. The new German *thaler* of silver is worth \$0.729, the specie

daler of Norway is equal to \$1.107, the *ten-thaler* (gold) of Denmark is worth \$7.861. The value varies in different parts of Germany; the Russian *thaler* is worth 71 cents. The word *thaler* is thought by some to be taken from the name of a mining town in Bohemia, called Joachimsthal (Joachim's dale), in which these pieces were coined, and that they were first known as *Joachimsthaler* and then for brevity *thaler*. German scholars derive the term *thaler* from *talent*, signifying a pound of gold. In the early part of the 16th c. the silver coins in use at Joachimsthal weighed 1 ounce. In Sweden the *rigsdaler riksmunt* is about 27 cents. In Denmark the *rigsbank daler* is about 54 cents. In Germany generally the *thaler* of account is from about 69 cents to 73 cents, American currency. In other countries the *Loeffthaler* or leaf dollar is in use; the *Pfennigthaler*, the Swedish copper dollar, and in Spain the *ducado*, the Spanish pillar dollar, which was taken as the basis of the United States coinage and money of account. In most European countries the mints have coined *thalers* (varying in value with the locality), hence called *rigsdaler* or *reichsthaler*, the dollar of the realm.

THALÉS, an early Greek philosopher, founder of the Ionic or physical school of philosophy, and one of the seven wise men (q.v.), was a native of Miletus, in Asia Minor, and flourished toward the close of the 7th c. B.C. Very little is known regarding his life. He is said to have recommended the Ionians, who were menaced by the Persians, to form a federation against their powerful enemy, and to select Teos as the capital. At a later period, we are told he induced the Milesians to withdraw from a union with Croesus against Cyrus. He is also said to have predicted the eclipse of the sun which happened in the reign of Alyattes. His claim to the title of sage (as in the case of his contemporaries) was due to his practical wisdom rather than to his speculative achievements. Nevertheless, Thales has a name in the history of speculative philosophy. He is even regarded by some as the *first* Greek that speculated on the constitution of the universe. According to him, the original principal of all things is water, from which everything proceeds, and into which it is again resolved. It would appear also that in connection with this doctrine he had some idea of a soul or force in water productive of all the phenomena we see, but it is impossible to ascertain the extent of his belief in an immaterial power. Most probably, his philosophy was a form of pantheism, rather than of theism. None of Thales' speculations were committed to writing, and it is only from the notices of later Greeks, such as Herodotus, Aristotle, etc., that we can gather an idea of the character of his thinking.—See Ritter's *Geschichte der Ionischen Philosophie* (Berl. 1821), Lewes's *Biographical History of Philosophy*, and prof. Ch. A. Brandis, in Smith's *Dic. of Gr. and Rom. Biog.*, art. "Thales."

THALLIUM (symb. Tl, equiv. 204, spec. grav. 11.9) is a metal which derives its name from the Greek word *thallos*, green, because its existence was first recognized by an intense green line appearing in the spectrum of a flame in which thallium is volatilized. It was discovered by Mr. Crookes, the editor of the *Chemical News*, in 1861, in the seleniferous deposit of a lead chamber of a sulphuric acid factory in the Hartz mountains, where iron pyrites is employed for the production of the acid. In the following year, it was obtained in larger quantities from a similar source by M. Lamy, who exhibited magnificent specimens of it in solid bars at the last great exhibition in London. Thallium is slightly heavier than lead—a metal which it resembles in its physical properties. It is very soft, being readily cut with a knife, or drawn into wire; and its freshly-cut surface exhibits a brilliant metallic luster and grayish color, somewhat between those of silver and lead. In contact with the air, it tarnishes more rapidly than lead, and becomes coated with a thin layer of oxide, which preserves the rest of the metal. It fuses below a red heat, and is soluble in the ordinary mineral acids. With oxygen, it enters into two combinations—viz., *Oxide of Thallium*, which is a strong base, forming well-defined salts with acids; and *Thallic Acid*, which is soluble in water, may be obtained in crystals, and forms soluble salts with the alkalis.

There is a difference of opinion as to whether the salts of thallium are or are not powerful irritant poisons. Lamy (with the view of testing the statement of Paulet, that the salts are poisonous) dissolved 75 grains of the sulphate in milk; and he found that this quantity sufficed to destroy two hens, six ducks, two puppies, and a middle-sized bitch. In one experiment, a grain and a half proved fatal to a puppy. Mr. Crookes, on the other hand, although much exposed to the fumes of this metal, suffered no particular effects from them; and he swallowed a grain or two of the salts without injury. He found that the latter have a local action on the hair and skin, staining the former, and rendering the latter yellow and horny.—For further details regarding this metal, the reader may consult Mr. Crookes's memoirs in the *Philosophical Transactions* for 1862, and in the *Chemical News*, and Lamy's memoir in the *Annales de Chimie et de Physique* for 1863.

THALLOGENOUS PLANTS are those acotyledonous plants which exhibit the greatest simplicity of structure, consisting of a mere thallus (q.v.) with reproductive organs. Of this description are *algæ*, *characeæ*, *fungi*, and *lichens*. When apparent leaves exist in any of these, they do not exhibit the symmetry always found in true leaves; and although some of them have stems or stalks, which attain, as in some sea-weeds, both to a considerable age and to great strength, all is composed of cellular tissue without any proper woody fiber.—In the botanical system of Lindley, the thallogenuous

plants form a class, under the name *thallogens*; and in that of Endlicher, a corresponding place is assigned to them under the name *thallophyta*.

THALLUS, in botany, a structure composed of cellular tissue, without woody fiber, which in some of the lower cryptogamic orders, as *algæ*, *fungi* and *lichens*, constitutes the whole plant, except the reproductive organs, which are situated in or upon it. The thallus assumes very various forms, sometimes crust-like, sometimes spread out like a leaf, simple, lobed, or branched; or, as in mushrooms, it becomes a stalk, cap, and gills.

THAMES, a river formed by the union, at Norwich, Conn., of the Yantic, Quinebaug, and Shetucket rivers. The course of the river is s., and it enters Long Island sound 3 m. below New London and 15 m. from the junction of the three rivers. The river, a picturesque tidal channel, is navigable for its full course, and its mouth forms New London harbor.

THAMES (Lat. *Tam-esis*; the root *tam* probably meaning broad, and *esis* or *ëis*, being identical with *esk*, *ex*, *ouse*, etc., all from Cel. *uisg*, water), the most important river of Great Britain, and the longest in England, flows e.s.e. across the s. portion of the country. Its remotest springs—those of the upper waters of the Churn—rise on the s.e. slope of the Cotswold hills, 3 m. s. of Cheltenham, and 7 m. w. of the Severn at Gloucester. The springs unite about a m. from their sources, and form the Churn, which flows s.e. 20 m. to Cricklade, and there receives the Thames, which joins it from the w. after a course of 10 miles. The Thames, or Isis, then flows e.n.e. for about 35 m., when, curving s.e., it passes Oxford, and flows on to Reading, where, after receiving the Kennet from the w., it again changes its course; and with a generally eastward course, it passes Windsor, Eton, Richmond, London, Woolwich, and Gravesend, a few miles below which it expands into a wide estuary, and enters the North sea. The length of the Thames is estimated at 250 m., the area of its basin at upward of 6,000 sq. miles. Throughout the greater part of its course, it is of importance as forming the boundary-line between several of the southern counties. Passing Cricklade, it forms part of the northern boundary of Wilts, and below this point it separates the counties of Oxford, Buckingham, Middlesex, and Essex on the n. from those of Berks, Surrey, and Kent on the s., except certain outlying bits of some of these counties. Its chief affluents are the Coln, Leach, Windrush, Cherwell, Thame, Colne, Lea, and Roefing, on the left; and the Kennet, Loddon, Darent, Mole, and Medway, on the right bank. At Vauxhall bridge, the width of the river is about 220 yards; at London bridge, 290 yards; at Woolwich, 490 yards; at Gravesend pier, 800 yards; 3 m. below Gravesend, 1290 yards; and at its mouth, between Whitstable and Foulness Point, about 8 m. below the Nore, it is 18 m. across. At the Nore Light, the commonly reputed mouth of the Thames, the breadth is 6 miles. The river is navigable for barges to Lechlade, upward of 200 m. above its mouth, and it is connected with the Thames and Severn, Oxford, Wilts and Berks, Grand Junction, and several other important canals, by means of which it maintains free communication with the w. and s. coasts, and with all parts of the interior of the country. Vessels of 800 tons can reach St. Katharine's docks, while those of 1400 tons can ascend to Blackwall, 6 m. below London bridge. The part of the river immediately below London bridge is called the *Pool*; and the part between the bridge and Blackwall is called the *Port*. Two embankments have been formed, one on the n. shore from Blackfriars bridge to Westminster, and one on the s. shore from Westminster bridge to Vauxhall. See LONDON.

THAMES, BATTLE OF THE, at the Moravian settlement on the Thames river, Ontario, Can., Oct. 5, 1813; between the American forces under gen. William H. Harrison, and the British under gen. Proctor with 2,000 Indian allies under Tecumseh. Tecumseh was killed during the battle. The charge of the cavalry under col. Richard M. Johnson began and decided the battle, in which 600 British prisoners were taken, besides, stores, cannon, etc. See TECUMSEH, and HARRISON, WILLIAM HENRY.

THANATICI is the term used by the superintendent of the statistical department in the registrar-general's office, Dr. Farr, in his *Nosology*, to indicate "lesions from violence tending to sudden death." These lesions are the direct results of physical or chemical forces, acting either by the will of the sufferer or of other persons, or accidentally.

THANE, or **THEGN** (A.-S. *thenen*, analogous to Ger. *diene*, to serve), a title whose use in the early feudal ages has been the subject of much discussion. In England, in Saxon times, the king's thane was a "miles emeritus," who, on the cessation of his actual service about the king's person, received a benefice or grant of land. The term "miles," when used by Bede, is uniformly rendered "cyringes then" by his Saxon translator. In the 10th c., all who would, in the feudal era, have been known as tenants *in capite*, were thanes. After the conquest, thanes and barons are classed together; and in Henry I.'s time the terms seem to be used synonymously. The office or dignity appears to have been attached to particular estates; thane lands are frequently mentioned in Domesday. After the reign of Henry II., the term fell into disuse. The title thane was introduced at a later period into the northern parts of Scotland, where, however, it did not express the same rank and dignity as in England; the tenure not being military, but in fee-farm.—The Scottish thane seems to have been a hereditary tenant, paying the sum at which the land stood in the king's rental, and

retaining his ancient authority strengthened and legalized. The title was in occasional use in Scotland down to the end of the 15th century. Hector Boece's notion of the Scottish thanes being all made earls, which has been adopted in Shakespeare's *Macbeth*, is devoid of historical foundation.

THANET, ISLE OF, forms the north-eastern corner of the county of Kent (q.v.), from the mainland of which it is cut off by the river Stour and its branches, and is bounded on the n. and e. by the sea. It is 10 m. in length, and from 4 to 8 m. broad; and contains 25,500 acres, of which 23,000 are arable, and 3,500 in marsh and pastures. The surface is high, but in the main, level; the soil is in general light and chalky; the island, however, is rich and fruitful—agriculture being successfully pursued. Besides the ordinary crops, canary and radish seeds are largely grown. On the shores of the island are the well-known watering-places, Ramsgate, Margate, and Broadstairs; and on the n. foreland, in the n.e., there is a light-house, 340 ft. above sea-level, and, visible at the distance of 22 miles. Pop. (1871) 42,129.

The isle of Thanet, the British name of which was *Ruim* (a headland), was at one time separated from the mainland by a sea-passage, called the Wantsome, which in Bede's time was one-third of a mile wide, and was passable only at Sarre and Wade. The Wantsome was the general sea-passage toward London for the Danish ships, but in 1500 it became finally closed.

THANKSGIVING DAY is chiefly an American institution. After the first harvest of the New England colonists in 1621 gov. Bradford made provision for their rejoicing specially together with praise and prayer. In 1623 a day of fasting and prayer in the midst of drought was changed into thanksgiving by the coming of rain during the prayers; gradually the custom prevailed of appointing thanksgiving annually after harvest. These appointments were by proclamation of the governors of the several New England states. During the revolution a day of national thanksgiving was annually recommended by congress. Washington recommended such a day, after the adoption of the constitution, and his example was occasionally imitated by subsequent presidents. During the rebellion, pres. Lincoln frequently recommended the observance of such a day after victories, and made a proclamation for a national observance in 1863. Since that time such a proclamation has been annually issued, and custom has fixed on the last Thursday of November as the time. Of late years, the custom of appointing a Thanksgiving day by the governors of states, long confined to New England, has been adopted through the country.

THANN, a t. of Germany, in the province of Alsace-Lorraine, at the foot of a hill crowned by the ruins of the castle of Engelburg, 13 m. w.n.w. of Mulhouse. It contains a superb gothic church, surmounted by a spire of delicate open work, upward of 300 feet high. Cotton cloths, chemicals, and machinery are manufactured. Pop., '75, 7,532.

THASOS, the most northerly island in the Ægean sea, a few miles off the coast of Macedonia. Circumference about 40 miles; pop. about 5,000, scattered over a dozen villages. Thasos is mountainous, and on the whole, barren. The description of it given by Archilochus is still applicable: "An ass's backbone overspread with wild wood." It exports some oil, honey, and timber. In ancient times the island was famous for its gold mines, which appear to have been worked from a very remote antiquity, and which, immediately before the Persian wars, yielded upward of 300 talents yearly; but they have long since been abandoned. Some remains of the ancient town of Thasos still exist.

THATCHER, HENRY KNOX, 1806–80; b. Thomaston, Me., grandson of gen. Henry Knox, entered the navy as midshipman, 1823; rose through successive grades to capt., 1861; commander, 1862. He commanded the frigate *Constellation* in the Mediterranean, 1862–63, the steam frigate *Colorado*, n. Atlantic blockade squadron, 1864–65. He distinguished himself in the attacks on fort Fisher under Porter, 1864–65, and in the siege of Mobile under Farragut, co-operating with gen. Canby in 1865; receiving the surrender of the confederate naval force in Mobile bay; appointed rear-admiral, 1866, for gallantry in this action; retired, 1868; residing at Winchester, Mass., and Nahant. He was at one time commandant of the Charlestown navy-yard, a member of the Bunker Hill monument association, and pres. of the Massachusetts society of the Cincinnati; succeeding his grandfather in membership.

THAYER, a co. in s.e. Nebraska, adjoining Kansas; drained by the Little Blue river and Big Sandy creek; traversed by the St. Joseph and Denver railroad; 575 sq.m.; pop. '80, 6,113—5,241 of American birth. The surface is mostly rolling prairie. The soil is fertile. The principal productions are corn, wheat, and cattle. Co. seat, Hebron.

THAYER, JOSEPH HENRY, D.D., b. Boston, 1828; educated at Harvard college and Andover theological seminary; for a short time pastor of a Congregational church in Salem, Mass., and an army chaplain. In 1864 he became associate professor of sacred literature in Andover theological seminary, where he still (1881) remains. He has published a translation of Winer's *New Testament Grammar*, and of Buttmann's *New Testament Grammar*.

THAYER, SIMEON, 1737-1800; b. Mass.; served in the French and Indian war, 1756-57, and was taken prisoner at fort William Henry. On the outbreaking of the revolution he received a capt.'s commission, and was with Arnold in the Quebec expedition, where he was made prisoner. After his release he did gallant service at Red Bank, fort Mifflin, and the battle of Monmouth, where he was severely wounded. In 1781 he left the army. He wrote a *Journal of the Invasion of Canada in 1775*.

THAYER, SYLVANUS, 1785-1872; b. Mass.; educated at Dartmouth college and at West Point. He was appointed to the engineers, served through the war of 1812, and was chief engineer of gen. Dearborn, gen. Hampton, and gen. Porter, successively. Visiting Europe on professional duty, he witnessed the movements of the allies before Paris, and studied the military systems of France and other countries. He was superintendent of the U. S. military academy, 1819-23, and raised it to a high standing. He afterward supervised the construction of the defenses of Boston harbor. In 1857-58 he commanded the corps of engineers. He was retired in 1863, with the rank of col. He founded the Thayer school of civil engineering at Dartmouth college, and a free public library in his native town of Braintree.

THAYER, THOMAS BALDWIN, D.D., b. Boston, 1812; educated in Boston; pastor of a Universalist church, Lowell, Mass., 1833-45; and in Brooklyn, N. Y., 1845-51; returned to Lowell, 1851; settled in Boston, 1857-69. He is editor of the *Universalist Quarterly*; has published *Christianity against Infidelity*; *The Theology of Universalism*.

THEA. See TEA.

THEATER, a place for public representations, chiefly of a dramatic or musical description. Theaters are of very ancient origin. They were found in every Greek city, both at home and in the colonies, and many very interesting specimens of the Greek theaters still exist in very good preservation. These were not built like modern theaters, with tiers of galleries rising one over the other, but were constructed with concentric rows of seats rising in regular succession one behind and above the other like the steps of stairs. These seats were frequently cut in the solid rock; and a place where the natural curve and slope of the ground rendered such excavation easy, was generally chosen. The seats, or audience department, were arranged in a semicircular form. In the center, at the lowest point, stood the orchestra; and the proscenium, or place for the dramatic representation, formed the chord of the semicircular auditorium. Behind this was the scena, closing in the building was a solid wall, generally ornamented with pillars, cornices, etc. There was no roof, but the audience was probably protected from the sun's rays by a curtain stretching across the theater. This form of theater was also that adopted by the Romans, who built or excavated large theaters in many of their important towns. The theaters of the Romans differed from their *amphitheaters* (q.v.), the former being semicircular, the latter oval, and with seats all round. Of the theaters still remaining, that of Orange, in the s. of France, is one of the finest, the auditorium being 340 ft. in diameter. During the middle ages, theaters were unnecessary, and were never built. The few dramatic performances then in use, which were chiefly of the nature of holy mysteries, were represented in the cathedrals. From the remains still existing, however, there would seem to have been large open-aired theaters at an early age in this country. Of these Piran Round in Cornwall is the best example. It is circular, with raised platforms all round for spectators, after the manner of the Greek theaters. With the revival of classical literature in the 16th c., the classical drama was also reproduced, and naturally along with it the classical form of theater. The first specimens of what may be called modern theaters (although founded on the old Greek model, according to Vitruvius's description) were the Teatro Olympico, erected by Palladio in Vicenza; a similar one in Venice, also by Palladio; and another in Vicenza, by Serlio. In Italy and Spain, open court-yards, with galleries round them, were at first the scenes of dramatic performances. In France and England, where the climate did not so readily admit of open-air representations, the first plays performed were exhibited in tennis or racket courts, in which there were usually galleries at one end; and as this accommodation was found too limited, these were afterward carried along the sides also. But dramatic literature soon became so important that buildings had to be designed for the express purpose of its representation. Accordingly, in Paris, the theater of the hôtel de Bourgogne was erected in the beginning of 17th century. It was rebuilt 1645, with tiers of boxes on a square plan. In 1639, the theater of the Palais Royal was erected by Richelieu, and was long considered the best model. The present circular plan of the galleries, with pit sloping backward, seems to have been first introduced in Venice in 1629; and the horse-shoe form of the boxes was first carried out by Fontana in the Tordinoni theater, at Rome, in 1675. The modern form of the auditorium was thus invented, and gradually improved and perfected, till in about a century similar theaters were erected all over Europe; the Scala theater at Milan, the largest in Italy, and the great theater at Bordeaux, being built, the former in 1774, and the latter in 1777. The plan of the Scala theater at Milan shows the general disposition of all the parts of the modern theater on the largest scale. Modern theaters are all very similar in their general distribution. They are divided into two distinct departments—viz., the auditorium or audience department, and the stage or scenic department. In the former, the seats are invariably arranged on a sloping ground-floor or "pit;" and on several tiers or galleries, extending in a semicircular or

horse-shoe form round the house. On the ground-floor, the front rows of seats are generally set apart as "dress stalls," and the back part only is then called the "pit." In opera-houses, the stalls generally occupy the greater portion of the space, and the "pit" is reduced to a minimum. In dramatic theaters, the tiers of galleries have the floors arranged in stages, rising above one another in such a manner as to enable the spectators all to see over those before them to the front of the stage. In theaters for operatic representation, the galleries have the floors laid level, and are divided all round into private boxes. The top tier is, however, sometimes left partially open, and has the seats on stages. In the larger opera houses, there are usually retiring-rooms connected with each of the private boxes. There is also a "crush-room," or large saloon, in which the audience may promenade between the acts. In all French theaters and opera-houses, these saloons, or *foyers*, are very large, and elegantly fitted up. They are almost always over the entrance-hall. In some of the modern French theaters, there are two foyers, one over the other, for the different classes who occupy the dress circle and the upper galleries. The question has often been raised as to the best form for a theater, both for hearing and seeing. It is a most difficult question to decide theoretically as regards hearing, but it is quite clear that the old semicircular plan of the Greeks is as nearly as possible the best for seeing, as it places the seats all round at an equal distance from the center of the proscenium; and therefore we find, where seeing well is all-important, as, for instance, in a *lecture theater*, this old form is usually adopted. In an oblong house, on the other hand, the seat at the center of the galleries are much further removed than those at the sides from the center of the stage, and are thus at a disadvantage as regards hearing; while the side boxes are badly placed for commanding a view of the stage. The entrances and staircases of theaters are not generally so well arranged or so spacious as they should be. In French theaters, this is especially the case. In these, there is often only one narrow wooden stair on each side of the house, leading to all the galleries. Recent accidents by fire, and the risk the audience runs in case of want of proper exits, have drawn attention to this subject, and the legislature will probably determine that there must be a separate, wide, and easy stair to each gallery—as, indeed, there usually now is in theaters recently built in this country. For large galleries, these stairs should be at least six feet wide; and a strong iron hand-rail down each side of the stair would be found useful in case of a panic, to prevent a fatal crush. Besides the main passages for the use of the public, there ought to be private passages and doors leading to every part of the house, so that the manager may pass with ease to any point in the audience where his presence may be required.

The orchestra occupies the space immediately in front of the proscenium, and this space is arranged so as to be capable of being enlarged or contracted as occasion may require. The proscenium is a small portion of the stage which projects a few feet in front of the curtain, so as to enable the actors to stand well forward, that they may be distinctly heard by the audience. The part of the house on either side of the proscenium is that on which there is usually the greatest amount of ornament. The sides and ceiling of the proscenium form, as it were, the frame through which the picture represented on the stage is seen; and as on it every eye must rest, it is made more ornate than the rest of the auditorium. The ceiling, presenting as it does a large broad surface, and being well seen from many parts of the house, is also a place well adapted for ornament, and is generally made as handsome as possible. The same remark applies to the fronts of the dress circle and galleries. The stage extends backward from the proscenium, and ought to be of considerable depth, so as to admit of the scenic effects, dissolving scenes, etc., now so much run upon. The great length of the stage from front to back is one of the most striking differences between the modern and the ancient theater, and arises entirely from the introduction and development of movable scenery—an invention of the architect Baldassare Peruzzi, and first used in Rome before Leo X., in 1508. The floor of the stage is not laid level like the floor of a room, but is sloped upward from front to back, so as to elevate the performers and scenes at the back, and render them more easily seen. The inclination of the stage is generally about half an inch to every foot. The stage department of a theater not only requires to be very long, but also very lofty above, and deep below the stage, so as to allow the large frames on which the scenes are stretched to be raised or lowered in one piece. The stage itself is a most complicated piece of mechanism, a considerable part of it being made movable either in the form of *traps*, for raising or lowering actors, furniture, etc., or in long pieces, which slide off to each side from the center, to allow the scenes to rise or descend. There are also *bridges*, or platforms constructed for raising and lowering through similar openings, some of them the full width of the stage. The traps and bridges are almost all worked by means of balance-weights, and the slides by ropes and windlasses. Besides the large *frames* above described as containing pictures occupying the full opening of the stage, there are other scenes which are pushed from the sides to the center, each being only one-half the width of the opening. These are called *plats*, and usually slide in grooves above and below. The grooves are arranged in clusters at intervals, having clear spaces between, called the *entrances*, through which the actors pass on and off the stage. But in modern French theaters and in the opera-houses—such, for instance, as Covent Garden theater—these grooves are regarded as an incumbrance to the stage, and are entirely done away with. Their place is occupied by narrow openings or slits in the stage, below which are

blocks running on wheels, and containing sockets, into which poles are dropped from above, and to these the flats are attached. Another advantage of this system is, that the gas-wings and ladders may be made movable, and slip backward and forward in the same manner as the flats. When occasion requires, the whole stage can thus be entirely cleared. According to the old plan of fixed grooves, only the center of the stage can ever be cleared without unscrewing all the grooves, and the gas-wings must always remain in the same relative position. Besides the flats, there are also smaller scenes which move in the grooves. These are called *wings*, and are used to screen the entrance. Corresponding to the wings are similar narrow scenes dropped from above: these are called *borders*, and are used to hide the gas-battens. These and the scenes which are drawn up, the gas-battens, etc., are all worked by means of ropes from the *flies*, or galleries running along the sides of the stage at a high level. The ropes from these passing up into the barrel-loft (a space in the roof filled with large drums and barrels on which the ropes are coiled) and down again to the flies, form a complication which seems to the uninitiated observer an inextricable mass of confusion. While such is the usual arrangement connected with movable scenery, it is to be noted that latterly a very great change has been introduced into the higher class of theaters. This change consists in the dismissal of wings or sliding side portions of scenes with intervening gaps, and substituting for them large pieces of scenery resembling the sides and further end of a room—an arrangement every way more natural. In cases of this improved kind, the actors enter on the stage and depart by doors. In connection with the stage, it is usual to have a large space set apart for containing scenery, called the *scene-dock*. This is frequently placed at the back of the stage, and may, on occasion, be cleared out, to give extra depth to the scene. There are also numerous apartments required in connection with the stage for the working of the theater—such as manager's room; dressing-rooms for the actors and actresses; the "green-room," in which they assemble when dressed, and wait till they are called; "star-rooms," or dressing-rooms for the stars; the wardrobe, in which the costumes are kept; furniture stores, scene stores; "property"-makers room; and workshops for the carpenter, gas-man, etc. There must also be a good painting-room, which must necessarily be a large apartment, from the size of the pictures which have to be painted—each being the full size of the opening of the stage. The canvas for these scenes is stretched on frames, which move up and down by means of a winch with balance-weights; and thus the painter stands comfortably on the floor, and moves his picture up or down, so as to get at any part he wishes. An interesting point on the stage is the prompt corner, from which the prompter has command of all the lights of the house, and bells to warn every man of his duty at the proper moment. He has a large brass plate, in which a number of handles are fixed, with an index to each, marking the high, low, etc., of the lights; and as each system of lights has a separate main pipe from the prompt corner, each can be managed independently. The side of the house on which the prompter is seated is called the "prompt side," and the other side is called the "O. P." or *opposite side*.

The house, or auditorium department, is generally lighted by means of a large luster or sun-light in the center of the ceiling, and much of the effect of the building depends on how this is managed. There are also usually smaller lights round one tier of the boxes at least. The proscenium is lighted by a large luster on each side, and by the foot-lights, which run along the whole of the front of the stage. These are sometimes provided with glasses of different colors, called *mediums*, which are used for throwing a red, green, or white light on the stage, as may be required. The stage is lighted by rows of gas-burners up each side and across the top at every entrance. The side-lights are called *gas-wings*, or *ladders*; and the top ones, *gas-battens*. Each of these has a main from the prompt corner. They can be pushed in and out, or up and down, like the scenery. There is also provision at each entrance for fixing flexible hose and temporary lights, so as to produce a bright effect wherever required. The mediums for producing colored light in this case are blinds of colored cloth. Another means of producing brilliant effects of light is the lime-light, by which, together with lenses of colored glass, bright lights of any color can be thrown on the stage or scenery when required.

Theaters are usually either very cold or insufferably hot. This arises from want of proper means of heating, and insufficient ventilation. The center luster is the great cause of ventilation, the draught caused by its heat drawing off the foul air at the ceiling. The suction caused by this withdrawal of air is naturally supplied from the great body of air in the stage. The stage ought, therefore, to be moderately heated by means of hot-water pipes or otherwise, so as to prevent cold draughts. The passages and lobbies round the house should also be heated in the same way, so that any air drawn in to the house may be properly tempered. An attempt has been made in Paris, of late years, to obviate the great heat and draught caused by the center luster, by doing away with the luster, and making the ceiling partly of glass, with powerful lights and reflectors behind the glass in the roof. This mode of lighting is, however, of rather a subdued character for a theater, although very appropriate to such chambers as the house of commons, where it acts admirably. In Paris they have also tried to supply fresh air from the gardens outside by means of a large tube, from which numerous small tubes branch and distribute the fresh air all round the theater from the fronts of the boxes, round the proscenium, etc. The idea is an excellent one, and is said to answer well practically.

There is a novel and agreeable class of theaters now in use in Germany, but of which we have as yet no specimens in this country. It consists of a double auditory, one at each end of the stage. One of these auditories is arranged and lighted in the usual manner, and is called the winter theater. The other auditory is called the summer theater, and is so arranged that performances may be represented in daylight during the summer season. It is lighted by large windows in the outer wall, which corresponds in form to the interior curves of the galleries, and also by windows in the roof. The entrances are by means of staircases at each side, near the proscenium, and by wide corridors and balconies round the curve of the exterior wall. One of the most effective of these summer-theaters is the Victoria in Berlin, by Zitz.

The art of *dramatic representation* has undergone great changes. In ancient Greece, partly from the character of the subjects selected, and partly from the origin of the drama itself, costume and acting were conventional, artificial, and stereotyped. On this point, we quote the words of Witzschel, who has written a handbook for students on the Athenian stage. (Eng. transl. by Paul; ed. by T. K. Arnold, Lond. 1850): "There can be no doubt," says he, "that the somewhat fantastic costume which was handed down without any change from one generation of actors to another was closely connected with the religious character of their tragic performances. The peculiar fashion and brilliant colors of the tragic wardrobe belonged rather to the Dionysian solemnities than to the stage. That Æschylus, by whom the greater part of it was invented, kept steadily in view the original intention of tragedy is evident from the notices which we find in ancient writers of his theatrical dresses having been worn in other religious ceremonies and processions. It is only reasonable to suppose that he would have given to the tragic stage a wardrobe of a very different description had he not been influenced by the conviction, that theatrical performances were in some sort a religious ceremonial. Another proof of the feeling entertained on this subject may be found in the ridicule with which Aristophanes overwhelms Euripides for introducing his heroes, not only in pitiable situations but in dirty, ragged, and beggarly weeds, to the great disgust of all true-hearted Athenians, and the utter annihilation of tragic ideality. In the *Acharnenses*, the whole of the tragic poet's squalid wardrobe is held up to public derision.

"The tragic costume for male characters of the highest rank consisted of an embroidered tunic with sleeves, which, in the older personages reached to the feet (*chiton poderes*), and in the younger to the knees. Over this was thrown a green pall, or long mantle (Gr. *surma*, Lat. *palla*), which also reached to the feet, and was richly ornamented with a purple and gold border. Persons of high but not royal rank wore a shorter red mantle, embroidered with gold, which was partially covered by a richly-embroidered, high-fitting scarf. Soothsayers wore over the tunic a kind of a network, composed of woolen threads. A sort of waistcoat (*kolpōma*) was also worn over the tunic. This was the costume of powerful and warlike sovereigns, such as Atreus, Agamemnon, etc. Dionysus (Bacchus) appeared in a purple tunic, which hung negligently from an embroidered shoulder-knot, and a thin, transparent, saffron-colored upper robe, with a thyrsus in his hand. Even Hercules himself was not the athletic hero of the old mythology, with a lion's skin thrown loosely round his muscular limbs, but a solemn, theatrical personage, enveloped in a long mantle. The costume of a queen was a flowing purple robe, with a white scarf; and for mourning, a black robe, and blue or dark yellow shawl. Persons in distress, especially exiles, wore dirty-white, dark-gray, dingy-yellow, or bluish garments. . . . To increase their height, the tragic performers wore the *cothurnus*, a sort of buskin, with high soles and still higher heels, which compelled them to walk with a measured and sounding tread; and a top-knot of hair, or toupet (Gr. *ongkos*), suitable to the age and condition of the character represented. A corresponding breadth of figure was produced by means of padding and by a sort of glove. Thus equipped, the tragic hero seemed a giant as compared with ordinary mortals. Lastly, they had the mask, a part of the ancient theatrical costume which seems to us so strange and unnatural. For its meaning and origin we must go back to the Dionysian festival, at which the excited crowd were wont, in honor of the jolly god, to smear their faces with lees of wine; and at a later period, when dramatic interludes were attempted, with vermilion, or to cover their cheeks with rude masks of bark. In the course of time these primitive inventions were discarded, and their places supplied by linen masks, characteristically painted. For the sake of retaining this uncouth but distinctive appendage of the Dionysian festival, the Greeks were content to forego the delicate expression of feeling and eloquent play of features which are indispensable to a modern actor; but on the other hand, when we remember the enormous size of their theaters, which scarcely permitted the assembled thousands to hear what was said by the actors, still less to distinguish their features, we are forced to acknowledge that the practice of wearing masks was rather an advantage than an inconvenience." The above description is, in the main, applicable to the Roman as well as the Greek theaters. The only additional point which it is necessary to notice is that, among the ancients, the acting of plays was not (as it is now) a regular and daily, but only an occasional affair, at festival seasons and the like. With the fall of the western empire, the disappearance of classic paganism and classic tastes, and the triumph of the Christianised barbarians of the n. and e., theatrical performances ceased. But the liking for such things is not artificial; it is natural and irrepressible; and gradually, as the ancient culture resumed

something of its former sway, efforts were made, not indeed, to re-enact the majestic tragedy of Greece (for its language was scarcely known), or the pungent comedy of Rome, but to throw into dramatic form the "mysteries," "miracles," and "moralities," of the Christian religion. The rudeness of these mediæval plays may perhaps suggest to us what Greek performances were before the days of Thespis. In fact, they were introduced as a means of edifying, as much as of amusing, the ignorant laity, were customarily the works of monks, and were performed on festive occasions in the churches. It does not, however, appear that they were accompanied by any *scenic* representations. A raised wooden stage like that which forms the front of a traveling show, was all that the untutored taste of the times demanded. Nor are we to suppose for a moment that the slightest attention was paid to propriety of costume or speech. The personages rather than the actions, the ceremony rather than the dialogue, the moral rather than the matter, were the things looked to, and hence no subtle or artistic representation of life and character was possible. The development of the modern drama (q.v.) ultimately restored the art of the actor to its ancient dignity and importance; but it was long before those changes took place that gave theatrical performances their modern character. Good acting—that is to say, skillful impersonation of character and varied elocution—became quite common in England after the restoration, and was not unknown before it; but appropriate costume and scenery were scarcely thought of until the time of Talma (q.v.), toward the close of last century. Since then the best theaters have displayed a most creditable desire to reproduce, with something like verisimilitude, the outward "form and pressure," the garb, deportment, and air of the age represented.

The employment of female actors is of French origin, and dates from the first half of the 17th c.; but they were not permitted (without molestation) to tread the English stage till 1661. Before this innovation, female parts were performed by youths; and though it ill consorts with *our* ideas of adequate representation to conceive the parts of Desdemona, Ophelia, Cordelia, etc., executed by those of another sex, it would appear that several actors obtained a wonderful success in this line.

The title of "his majesty's servants," which English actors once bore, originated in the fact that some of them were really members of the royal household. The king and particular nobles kept troops of actors for their own pleasure, whom they sometimes permitted to go about the country and perform. The first prince we read of that gave his "servants" such permission, was Richard, duke of Gloucester (afterward Richard III.). In queen Elizabeth's time (1571), the earl of Leicester's "servants" were licensed to open the first *public* theater in England, and it is owing to the circumstance of actors having originally formed part of the household of the king that a license from the lord chamberlain is still necessary to the opening of a theater.—For an anecdotal and amusing history of the English stage see *Their Majesties' Servants*, by Dr. Doran (1865); see also Dutton Cook's *Book of the Play* (1876).

THEATERS, LAWS AS TO. In Great Britain all theaters must be licensed, either by virtue of letters-patent from her majesty, or by license from the lord chamberlain for the time being, or from justices of the peace. The lord chamberlain grants licenses to all theaters (not being patent theaters) within the English metropolis, and within the places where her majesty occasionally resides, except New Windsor and Brighton. For every license of the lord chamberlain, a fee not exceeding 10s. per month is charged. In other parts of Great Britain, the justices of the peace of the county, city, or borough must be applied to for a license; and after the usual notice, they hold a special session, for the purpose of granting licenses to theaters, the fee payable being a sum not exceeding 5s. per month. It is only to the actual and responsible manager of the theater that a license can be granted, and his name and place of abode must be printed on every play-bill. The manager must find sureties to observe the rules issued by the lord chamberlain and justices, which rules relate to the days and hours of keeping open, and the insuring of order and decency. A penalty of £10 is imposed, by statute 6 and 7 Vict. c. 68, on any actor or manager concerned in unlicensed places.

A copy of every new play, epilogue, or prologue, or alteration of the same, intended to be produced at any theater in Great Britain, must be sent to the lord chamberlain, by the manager, seven days before such production; and for examination of such plays and alterations of plays, he may charge fees not exceeding ten guineas, according to a scale fixed by him. He may forbid the acting of any play, whenever he considers it to be fitting to the preservation of good manners, decorum, or the public peace, to do so. To act a play not allowed or disallowed, subjects each actor and manager to a penalty of £50. It has been decided by the courts, that a booth used as a temporary or portable theater requires a license, and that any dialogue or dramatic performance by two persons is a stage-play, and therefore subject to the license. Of late, the policy of placing the theaters so entirely under the control of the lord chamberlain and justices has been disputed, especially as the increasing practice of introducing theatrical performances at public supper-rooms has led to some vexatious prosecutions at the instance of the licensees of regular theaters.

THEATINES, one of the more modern religious brotherhoods of the Roman Catholic church, which played a very important part in the well-known internal movement for

reformation which took place in central and southern Italy toward the middle of the 16th c., and which Ranke has described in his *History of the Popes*. The founders of this association were a party of friends: Cajetan di Thiene; John Peter Caraffa, at that time bishop of Theate (from which the congregation took the name *Theatine*); Paul Consiglieri; and Bonifazio di Colle. Cajetan and Caraffa, in concert with the two other friends named above, having resigned all their preferments, obtained a brief of Clement, dated June 25, 1524, formally constituting the new brotherhood, with the three usual vows, and with the privilege of electing their superior, who was to hold office for three years. One peculiarity of their vow of poverty deserves special notice: they were forbidden to possess property, and were to subsist entirely upon the alms of the faithful; and yet they were strictly forbidden to beg, or in any way to solicit charitable contributions. Their first convent was opened in Rome, and F. Caraffa was chosen as the first superior. He was succeeded in 1527 by Cajetan, and the congregation began to extend to the provinces. After a time, however, it was thought advisable to unite it with the somewhat analogous order of the Somaschians; but this union was not of long continuance; Caraffa, who was elected pope, under the name of Paul IV., having restored the original constitution in 1555. By degrees, the Theatines extended themselves, first over Italy, and afterward into Spain, Poland, and Germany, especially Bavaria. They did not find an entrance into France till the following c., when a house was founded in Paris under cardinal Mazarin in 1644. To their activity, devotedness, and zeal, Ranke ascribes much of the success of that remarkable reaction against Protestantism which took place in the latter half of the 16th century. In later times, however, they do not appear to have played any notable part. Their most remarkable member in modern times has been the celebrated Sicilian, Father Ventura, author of the well-known work *Bellezze della Fede*, and familiar to Englishmen by the part which he took in the Italian revolution of 1849. At present, the Theatine order is confined to Italy and Sicily.

THEINER, AUGUSTIN, 1804-74; b. Breslau; studied at Breslau and Halle: assisted his brother Johann Anton in a work on the history of celibacy; wrote an essay on the papal decretals which found great favor; visited Rome, 1831, became a member of the oratory of St. Philip Neri, fully identified himself with the ultramontane party, was consulter of the holy office. In 1848 he published a work opposing the election of bishops and priests by laymen, and maintaining the temporal sovereignty of the popes; was appointed in 1851 keeper of the secret archives of the Vatican, and published compilations illustrating the ecclesiastical history of the different Christian nations. His greatest work was the continuation of the *Annales Ecclesiastici* of Baronius in 1856. Having in 1869 corresponded with Dr. Döllinger and prof. Friedrich, and advocated the Old Catholic doctrine and position, he was debarred access to the archives, but his salary was continued, and he remained in the Vatican.

THEBAINE. See **OPRUM**

THEBES, the name of a celebrated Egyptian city, called by the Egyptians Taape, or Taouab; by the Hebrews, No-Amen; by the Greeks, Thēbæ; and at a later period, Diospolis Magna. It lies in the broadest section of the valley of the Nile, in about lat. 26° n., and was formerly the capital of Southern or Upper Egypt. Its ruins, the most extensive in that country, comprise nine townships, the most remarkable of which are Medinat Habu, Gournah, Karnak, and Luxor. Its local and eponymous god was Amen-Ra, or Jupiter Ammon; and its foundation traditionally dated from the time of Menes, the founder of the monarchy, although no remains of so early a date have been discovered on the site. Recently, however, excavations have brought to light constructions of the 11th dynasty, who appear to have founded the original temple of the god. The Nile flows through the midst of the ancient city, and divides into four principal quarters: Karnak and Luxor, which lie on the e. bank, and Gournah and Medinat Habu, on the w. bank of the river. The most flourishing period of the city was under the 18th, 19th, and 20th dynasties, or from about 1500 to 1000 B.C., when it had supplanted Memphis, the ancient capital of the Pharaohs. The more central situation of this city probably caused it to rise into importance, for it was secure against the northern enemies of Egypt; hence, under these Diospolitan dynasties, the worship of Amen-Ra arose in all its splendor; magnificent palaces and temples were built in its different quarters, to which additions were made by later monarchs, and even by the Ptolemies and Romans till the time of the Antonines, in the 2d c. A.D. Here, too, were the cemeteries of the Theban monarchs and the officers of their courts, colleges of priests, and the seat of royal government. It was enriched by the spoils of Asia and the tributes of Ethiopia, and its fame and reputation had reached the early Greeks, Homer describing it by the epithet of Hekatompylos, or City of a Hundred Gates, in allusion to its pro pylæa, for Thebes was never a fortified city. In the plenitude of its power it sent forth an army of 20,000 war-chariots; but the Bubastite and Tanite dynasties removed the capital again to Sais and Memphis, and Thebes declined in importance, although retaining much of its ancient grandeur. At the Persian conquest, Cambyses obtained a spoil of nearly £2,000,000 from the city, destroyed many of its noblest monuments, and injured its political pre-eminence. The foundation of Alexandria by Alexander the great, and other causes, still further injured the city; and although some repairs were made under the subsequent monarchs, its grandeur had departed. At the time of Strabo,

Thebes was only a cluster of small villages. When that geographer visited the city its extent was about $9\frac{1}{2}$ m. in length (according to Diodorus), its circuit was about 16 miles. Its temples, tombs, and ruins were visited by the Roman travelers; and Germanicus and Hadrian inspected the sculptures of the temples. At a later period, a considerable Christian population existed under the empire; but the inhabitants fled at the Arab invasion to Esneh; and Thebes is now inhabited only by a few Arab families of Fellahien, who obtain a precarious livelihood by guiding travelers over the ruins, or rifling the tombs for antiquities. At Gournah, is to be seen the Memnoneion, built by Ramesses II.; with a colossus of that monarch, weighing $887\frac{1}{2}$ tons, the largest statue in Egypt, broken. This is supposed to be the palace of Osymandias, described by Hecataeus, and is of considerable extent. In this quarter are two palace-temples of Amenophis III., and the vocal Memnon, or celebrated colossus of that monarch, supposed by the ancients to emit a sound at sunrise. At Medinat Habu is a pile of buildings, commenced by Thothmes I., of the 18th dynasty, with courts and propylæa, built by Ramesses III. or Rhampsinitus, and sculptures representing his victories over the Philistines, the life in his harem, the riches of his treasury, and a calendar with inscriptions dated in the twelfth year of his reign. Here, 8,000 ft. to the n.w., are the cemeteries of sacred apes; and 3,000 ft. beyond, the valley of the tombs of the queens, consisting of 17 *syringes*, or sepulchers, supposed to be the tombs of the Pallacides of Amen, mentioned by Diodorus and Strabo. Near them are the Biban-el-Meluk, or tombs of the monarchs of the 19th and 20th dynasties, 16 in number, the most interesting of which are that of Sethos I., called Belzoni's, after its discoverer, and those of Ramesses III., and Siptah. At Gournah itself are the tombs of functionaries and others, and this latter site has enriched the museums of Europe with antiquities of various kinds. The palaces of the Luxor quarter were founded by Amenopais III. From hence was removed the obelisk of the Place de la Concorde in Paris. Still more magnificent than any of these is the temple of Karnak, the sanctuary of which, built by Osertesen I. of the 12th dynasty, was added to by the monarchs of the 18th dynasty. The most remarkable part of this wonderful mass of courts, propylæa, and obelisks, is the great hall, 170 ft. by 329 ft., built by Sethos I. and Ramesses II., having a central avenue of 12 massive columns, 60 ft. high, 12 ft. in diameter; and 122 other columns, 49 ft. 9 in. high, 27 ft. 6 in. in circumference; and 2 obelisks, 92 ft. high, and 8 ft. square. In this temple is also the so-called portico of the Bubastites, built by Shishak I., recording his expedition against Jerusalem, 971 B.C. The Ptolemies also restored this building.—Diodorus, i. 45; Strabo, xvi. p. 816; Wilkinson, *Topography of Thebes* (8vo. Lond. 1835); Champollion, *L'Égypte*, i. p. 199, and foll.; *Lettres*, pp. 63–73; Belzoni, p. 58.

THEBES, the principal city of Beotia, in ancient Greece, was situated in the southern part of the country, on the slopes of Mount Teumessus, and between two streams, the Dirce and the Ismenus. According to the prevalent tradition, Thebes was founded by a colony of Phenicians under Cadmus (q.v.), after whom the city was called Cadmeia—a name subsequently restricted to the citadel; but passing over the long series of picturesque and tragic myths that have given it its pre-historic fame (in which the central figure is Œdipus), we first catch a quasi-authentic glimpse of Theban history in the 8th c. B.C., when one Philolaus, a Corinthian, settled in the place, and drew up a code of laws for the inhabitants. It is not till near the end of the 6th c. B.C., however, that we reach a purely historical period—the earliest well-attested event being the dispute between Thebes and another Beotian city, Platææ, which involved the former city in an unsuccessful war with Athens. Henceforth, the relations of Thebes and Athens were, except for brief intervals, marked by bitter enmity. During the Persian war Thebes shamefully sided with the Asiatic invader, and, in consequence, lost much of her power and prestige. Athens proposed to deprive her of her supremacy over the Beotian confederacy; but Sparta, always jealous, even to spitefulness, of her Attic rival, interfered, and positively forced the other Beotian cities to acknowledge anew their unworthy mistress. When the Peloponnesian war broke out, Thebes took part with Sparta, and at its close, was eager for the destruction of Athens; but soon after it became jealous of the overgrown power of its ally, and gave a friendly welcome and shelter to those Athenians whom the oppression of the Thirty Tyrants (q.v.) compelled to abandon their city. It was from Thebes that Thrasybulus and his co-patriots started on their famous expedition for the deliverance of Athens, accompanied by a body of Theban citizens. A keen and bitter antagonism now sprung up between Thebes and Sparta, which, after many vicissitudes, ended in a great military struggle (379–362 B.C.), in which the former city, under the heroic guidance of Epaminondas (q.v.), achieved a brilliant triumph, and for a time held the position of the foremost power in Greece. It was now the time for Athens to revive her ancient animosities; and for a while they had free play. At length the eloquence of Demosthenes induced both states to unite in opposition to the encroachments of Philip of Macedon; but it was too late; and in 338 B.C. the battle of Chæroneia crushed the liberties of Greece. After Philip's death the Thebans made a fierce but unsuccessful effort to regain their freedom. Their city was taken by Alexander, who levelled it to the ground, and sold the entire population—men, women, and children—into slavery. For 20 years it remained an utter desolation; but in 315 B.C. it was rebuilt by Cassander, who gathered into it all the Thebans he could find in Greece. It was

again destroyed by the Romans, and did not recover till about the decline of the empire. During the 11th and 12th centuries it was the seat of a considerable population engaged in the manufacture of silk; but under the Turks it again declined, though it has still a modern representative, Thebes, or Thiva, with a pop. of 9,000. Scarcely a single relic of antiquity has survived the ravages of time.

THECLA, a virgin saint of the early church, whose existence may be considered historical, although all, or almost all, the details regarding her are legendary, being in great measure founded upon an apocryphal book, now lost, entitled *The Periods (circuits) of Paul and Thecla*, the unhistorical character of which is declared by Tertullian (*De Bapt.* ii. 17), and by St. Jerome in his catalogue of ecclesiastical writers. According to the legend, Thecla was a member of a noble family of Iconium in Lycaonia, where she was converted by the preaching of St. Paul, and having devoted herself to a life of virginity, suffered a series of persecutions from her intended bridegroom, as well as from her parents. As to the manner of her death, nothing is certain. She is styled in the Greek martyrologies the *proto-martyress*, as Stephen is the *proto-martyr*; while in the Roman breviary she is said to have died at the age of 90 in Seleucia, where her tomb was anciently pointed out. The *Acts of Paul and Thecla* was among the books stigmatized as "apocryphal" by pope Gelasius; but it is now lost.

THEFT. See LARCENY.

THEINE. See CAFFEINE and TEA.

THEISM, the doctrine concerning God, differing from pantheism by the relation which it affirms between God and the world of things; and from deism by the relation which it acknowledges between God and man. The pantheist asserts that God and the world are one; while the theist believes that a personal God, the creator of the world, is independent of it. The deist admits that God is the creator of the world, but denies that he has given a written revelation to man. Consequently, if man could exclude from his mind all the light which comes from revelation, his way would be dark indeed. But as the divine light shines around him, whether or not he acknowledge the source of it, his deism may become almost theism.

THEISS, an important affluent of the Danube, and the chief river of Hungary, rises by two streams, the Black Theiss and the White Theiss, in the Carpathian mountains, on the borders of Galicia. It flows first s. through a mountain-pass; but after receiving the Viso from the s.e., it changes its course to n.w. and s.w., flowing past Tokay to Szolnok, where it curves toward the s.; and after running parallel to the Danube for upward of 300 m., it joins that river about 5 m. below the town of Titel. The principal towns upon its banks are Szigeth, Tokay, Szolnok, Csongrad, and Szegedin. About one half of this last town was destroyed by an inundation of the Theiss in the spring of 1879. Its chief affluents are—the Vorsova, Bodrog, and Hernad, the Szamos, Körös, Maros, and Bego, the most of which are navigable. The Theiss is navigable at Szegeth for small vessels, at Namény for steamers, and at Szolnok for large vessels. At Szöllös it enters upon the plain, and below this point its fall is trifling, its course sluggish and very winding, and its banks low and marshy. At Tokay it is 300 ft. broad; at Szegedin, 400 ft.; and at Titel, 740 feet. Its length, in direct line from source to mouth, is 280 m.; the entire length, including windings, is 828 miles.

THELLUSSON ACT is an act of parliament, 39 and 40 Geo. III. c. 98, passed for the purpose of checking the disposition of testators to accumulate the income of their estates until it should form a large fortune. The late Mr. Thellusson had, by his will, directed his personal property to be invested in land, and the rents and profits of the land to be so purchased, and of his other real estate, to be accumulated during the lives of all his descendants who should be living at the time of his death, or born in a certain time thereafter; and then he limited the accumulated property in favor of certain of his descendants who might be then living at that distant time. The property was said to have consisted of landed estates worth £4,000 a year, besides personalty of about half a million; and it was estimated that the accumulated fund would amount to above 19 millions. The testator's object was to create enormous wealth for the purpose of founding three families to spring from his three sons. For three quarters of a century the questions arising out of this will have been discussed in various forms; but the legislature, soon after the testator's death, took the earliest opportunity of preventing in future testators accumulating the income in this way for more than 21 years, and the above act was passed for that purpose. In the courts the first attempt to upset the will of Mr. Thellusson was to make out that it was too uncertain to be carried into execution—next, that the accumulation was illegal—next, whether males claiming through females would be entitled to a share: all of which attempts to upset the will failed. Ultimately, however, the fund proved not to be so large as was anticipated, and was distributed among a greater number of claimants. The eldest son was created baron Rendlesham in 1806. The litigation ended by a decree of the house of lords in 1858. The Thellusson act has been extended to Scotland.

THEMIS (Gr. "what is established by old law"), in Greek mythology, was the daughter of Uranus and Gæ (heaven and earth), the wife of Zeus, and, by him, mother of the Horæ (hours) and Mœræ (fates), as also of Eunomia (equity), Dikē (justice), and Eirēnē

(peace). She was regarded as the personification of order and justice, or of whatever is established by "use and wont;" and as such was charged by Zeus to convoke the gods, and preside over them when assembled, being likewise represented as reigning in the assemblies of men. In modern art Themis is represented as having her eyes bandaged, and at the same time holding a pair of evenly-balanced scales in one hand, with a sword in the other.

THEMISTOCLES, the great Athenian general and statesman, was the son of an obscure citizen of Athens, and was born about 514 B.C. He was actuated by excessive ambition from a very early period, and began his public career by setting himself in opposition to the principal men of the state, and chiefly Aristides, "the just." It is uncertain whether he was at Marathon, but there is no doubt that the laurels gained there by Miltiades fired Themistocles's ambition. From the time (483) that he got his inconveniently upright rival, Aristides (q.v.), ostracised, he was regarded as the political leader in Athens, being made archon eponymus in 481. In order to recover for Athens the naval supremacy in Greece, and that she might be prepared to meet the expected Persian invasion, he persuaded the Athenians to devote the proceeds arising from the silver mines at Laurium to the construction of a fleet, sagaciously foreseeing that his country's only chance of overcoming her enemy was by sea. In the battles of Artemisium and Salamis (480), disastrous for the Persians, Themistocles, commander of the Athenian fleet, the largest in Greece, to avoid dissensions, was content to serve under Eurybiades the Spartan. On both these occasions it was only by the greatest tact, combined with threats and a judicious outlay of the bribes which he himself had received in profusion, that Themistocles could induce the other commanders to come to an engagement with the Persians. On the night previous to Salamis he sent a faithful slave to tell Xerxes that, unless he came up next day, the Greek fleet would be scattered, and he would miss the chance of an engagement; thus securing either victory to the Greeks or the favor of Xerxes to himself in case of defeat. See SALAMIS. In several other ways did the wily Themistocles contrive to provide for himself a safe retreat at the Persian court in case of disaster. The victory at Salamis raised his reputation to the highest point. Not neglecting his own personal aggrandizement, he sailed round among the Grecian islands, and on various pretexts extorted enormous sums from the inhabitants. Shortly after the Persian invasion, his fellow-citizens began to see through him, and he was accused of bribery and extortion. In 471 he was ostracised and retired to Argos; and finally, to escape being tried for treason, in which he was implicated by the correspondence of Pausanias, he betook himself, in 465, to the court of Artaxerxes, king of Persia; but before he would see the king himself, got permission to wait a year, during which he made himself master of the language and usages of Persia. At the end of this time he managed to raise himself so highly in the king's favor that, after the Persian fashion, the town of Magnesia was appointed to supply him with bread, Lamp-sacus with wine, and Myus with other provisions. He lived securely at Magnesia until his death in 449. Some authorities assert that he poisoned himself. A monument was erected to Themistocles in the market-place of Magnesia, and it is said that his bones were secretly taken to Attica, and burned there. Undoubtedly Themistocles was a man of very great sagacity and determination, had a quick and keen perception of difficulties both present and future, which his ready invention, backed by promptness of action, enabled him to meet and overcome. On the other hand, he appears to have been possessed of no moral principles, his greatest ambition apparently having been to make himself, by fair means or foul, the greatest man in Greece.

THÉNARD, LOUIS JACQUES, Baron, 1777-1857; b. Nogent-sur-Seine; studied chemistry with Vauquelin in Paris; demonstrator of chemistry in the polytechnique school of Paris, 1797-1837, subsequently professor of chemistry in the college of France and in the university of Paris. The title of baron was given him in 1824; member of the academy, 1833; made peer of France in the same year. He resigned his chair in the university, 1840. With M. Gay-Lussac he published *Recherches Physico chimiques*. In 1813 he began the publication of *Traité de Chimie Elementaire, Theorique et Pratique*, translated into German and French. He has given more time and money toward developing the scientific institutions of France than any one since Cuvier.

THE NARD'S BLUE. See BLUE.

THEOBALD, LEWIS, was the son of an attorney at Sittingbourne in Kent, at which place he was b. toward the close of the 17th century. His father's business, for which he was educated, proved not much to his mind; and betaking himself to literature, he published, in 1714, a tragedy entitled *Electra*, which he followed up by a number of other dramas. As a poet, he had scant success, and is long since utterly forgotten; but as the favorite butt of Pope, he is immortalized in the *Dunciad* of that writer. Besides this unenviable distinction, "piddling Theobald," as Pope contemptuously termed him, is not without some fair claim to be honorably remembered as one of the most laborious and useful of the early editors and commentators on Shakespeare. In this capacity, dull as he undoubtedly was, he did good service to the poet, which has since been sufficiently recognized. The hatred of Pope he incurred by a pamphlet published in 1726, entitled *Shakespeare Restored, or Specimens of Blunders committed or unamended in Pope's Edition of this Poet*; and if he could not compete with his adversary in wit, he proved

himself a much more complete editor of Shakespeare by his edition in 7 vols. 8vo, published in 1733, which quite extinguished that of his rival. His knowledge of our earlier drama was extensive and minute; and to his judicious application of it, in elucidating the text of the great poet, we remain to this hour not a little indebted. He died in Sept., 1744.

THEOBROMINE ($C_{14}H_{10}N_4O_4$) is a crystallizable principle present in chocolate. It is extracted from the cacao-nuts (the seeds of *theobroma cacao*) in the same manner as caffeine or theine is extracted from the coffee, tea, etc., in which that substance occurs. It is less soluble in water than caffeine, but resembles that substance in forming crystallizable salts with some of the acids. By dissolving theobromine in a solution of ammonia, and adding nitrate of silver, a gelatinous precipitate is obtained, which, by boiling with a solution of ammonia, yields a crystalline mass of theobromide of silver ($C_{14}H_7AgN_4O_4$), in which 1 equivalent of hydrogen is replaced by 1 of silver. This compound, when treated with iodide of methyl, yields iodide of silver and caffeine, which latter may be extracted with alcohol. Hence we arrive at the remarkable conclusion, that caffeine ($C_8H_{10}N_4O_4$) must be regarded as methyl-theobromine $C_{14}H_7(C_2H_5)_2N_4O_4$.

THEOCRACY, literally, "government by God," is the name given to that constitution of a state in which the Almighty is regarded as the sole sovereign, and the laws of the realm as divine commands rather than human ordinances. Under such a view, the priesthood necessarily become the promulgators and interpreters of the "divine commands," and act as the officers of the invisible Ruler. The most famous example of a theocracy is that established by Moses among the Hebrews.

THEOCRITUS, the creator and most celebrated composer of bucolic poetry, was the son of Praxagoras and Philinna, and b. at Syraeuse. The date of his birth is unknown, but the period of his greatest literary activity was probably 272 B.C. About the close of the reign of Ptolemy Soter, he visited Alexandria, where he received instruction, and made his first successful essays in poetry. He came to be patronized by Ptolemy Philadelphus, who assisted his father, Ptolemy Soter, in the government of Egypt; and in honor of his patron, he composed, about 285 B.C., his 14th, 15th, and 17th idyls. He further formed the acquaintance of the poet Aratus, to whom he addressed his 6th idyl. He subsequently revisited Syraeuse, where he continued to reside under Hiero II. From his 16th idyl, it may be concluded that he was dissatisfied with the political state of Sicily, and also with the insufficient rewards which his poems received from Hiero; and that, in consequence, he fixed his attention, during his declining years, rather on the life of the country than of the court, and on those scenes of rural nature which form the chief subject of his poetical remains. The idyls of Theocritus are principally representations, dramatic and mimetic in their character, of the every-day life of the Sicilian peasantry. They have been successfully imitated by Virgil, and have given origin at least to that so-called pastoral literature of mediæval and modern times, which is, however, totally deficient in the simplicity, fidelity, and therefore poetry of the Syracusan author. Theocritus knows nothing of the imaginary shepherds of a fictitious Arcadia; his dramatic simplicity and truth are in wide contrast to the affected sentiment, the unnatural innocence, and the artificial simplicity of that unreal world. Comedy and pathos enter freely into his representations of rural Sicilian life, and his idyls retain the charms of freshness and nature even to the present day. They are 30 in number, though all of them are not strictly bucolic, or even genuine. They are written in a mixed dialect, in which the softened Doric prevails; and together with a few lines from a lost poem called *Berenice*, and 23 epigrams in the Greek anthology, make up his remains, of which the best editions are those of Meineke and Paley; and the best translation in English, that of Dr. M. J. Chapman.

THEODICY (Gr. *Theos*, God, and *diké*, justice; Lat. *Theodicea*, the judgment of God), a name given to the exposition of the theory of Divine Providence, with a view especially to the vindication of the attributes, and particularly of the sanctity and justice of God in establishing the present order of things, in which evil, moral as well as physical, so largely appears to prevail. The name is of modern origin, dating from the close of the 17th c., or the beginning of the 18th c.; but the theory itself, as well as the mysterious problem which it meant to resolve, is as old as philosophy itself. See **EVIL**. The first to consider the question in its integrity was the celebrated Leibnitz (q.v.). His work entitled *Essai de Theodicée sur la Bonté de Dieu, la Liberté de l'Homme, et l'Origine du Mal*, was published in 1710. It rose at once to the very highest point of popularity, and was translated into almost every European language. The leading principle of Leibnitz's vindication of God's goodness is the well-known optimistic theory which has been explained elsewhere (see **OPTIMISM**); but he had been followed by several writers in different countries—as Balguy, Werdermann, Kindervater, Creutzer, Benedict Kapp, and many others. Of these writers, it may be said in general, that they have followed the same method, and have addressed themselves to the same view—viz., the reconciliation with the goodness, the sanctity, and the justice of the one God, the existence of those manifold evils, physical or material, as well as moral, which appear in the present order of things. This view, it will be seen, is strictly limited to one single problem. But in the discussions of the new philosophic systems, and especially that of Hegel, which have arisen in Germany, new difficulties regarding the Christian idea of God have arisen out

of the rationalistic notions of existence in general. To meet those difficulties, a new theodicy has become necessary, and it has begun to occupy the attention of philosophers, especially in France. Two works in particular addressed to this view of the subject may be noticed; the first is M. Maret's *Christian Theodiceë, or Comparison of the Christian and the Rationalistic idea of God*, 1845; the second is that of the Jesuit philosopher, Père Gratry, who has devoted the first volume of his course of philosophy, *De la Connaissance de Dieu*, to this special subject. This work was published at Paris, 1853.

THEODOLITE (Gr. *theaô*, I see, *dolichos*, long), an instrument much employed in land-surveying for the measurement of angles horizontal and vertical is neither more nor less than an altitude and azimuth instrument, proportioned and constructed so as to be conveniently portable. Like all instruments in very general use, the variations in its construction are almost numberless; but its main characteristics continue unaltered in all forms. It consists essentially of two concentric circular plates of copper, brass, or other material (the upper plate, or *upper horizontal*, either being smaller, and let into the lower, or *lower horizontal*, or the rim of the lower raised round the outside of the upper), moving round a common axis, which, being double, admits of one plate moving independently of the other. Upon the upper horizontal rise two supports, bearing a cross bar, which is the axis of a *vertical circle* moving in a plane at right angles to the former. This latter circle either has a telescope fixed concentric with itself, or a semicircle is substituted for the circle, and the telescope is laid above, and parallel to its diameter. The circles, as their names denote, are employed in the measurement of horizontal and vertical angles. For these purposes the outer of the horizontal circles is graduated, and the inner carries the index-point and the verniers (q.v.); the vertical circle is also graduated, and the graduations are generally read off by an index-point and vernier firmly attached to the supports. The upper horizontal is furnished with two levels placed at right angles to each other, for purposes of adjustment, and has a compass-box let into it at its center. The stand consists of a circular plate supported on three legs, and connected with the lower horizontal by means of a ball-and-socket joint; the horizontal adjustment of the instrument being effected by means of three or four (the latter number is the better) upright screws placed at equal distances between the plates. The telescope is so fixed as to be reversible, and the adjustments are in great part similar to those of other telescopic instruments, but are too numerous and minute to be here detailed. Both horizontal plates being made, by means of the screws and levels, truly level, the telescope is pointed at one object, and the horizontal angles read off; it is then turned to another object, and the readings-off from the graduated circle again performed; and by the difference of the readings, the angular horizontal deviation is given; and when vertical angles are required, the readings are taken from the vertical circle in a similar manner.

THEODORA, Empress, 508-548; b. Cyprus; a dancer and courtesan at Constantinople, to whom Justinian was married in 525. He proclaimed her empress on his accession to the throne in 527, and she seems to have exerted considerable influence in public affairs. The legislation of Justinian for improvement of the stage was, no doubt, due to her. By that legislation any actor becoming a Christian could not be obliged to remain upon the stage if he had conscientious scruples against doing so.

THEODORE, King of Abyssinia, otherwise described as Negus, emperor or king of kings of Ethiopia, a prince whose extraordinary career has excited much interest since war was declared against him by the English government. At the time when the article ABYSSINIA first appeared in this work, the subject was not of much importance to English readers, and a few additional remarks were therefore necessary to explain the leading events in the life of Theodore. Abyssinia forms, it will be recollected, a table-land, which, although lying within the tropics, has, owing to its great elevation, a cool and equable climate. Its inhabitants, who have a Caucasian or European physiognomy, profess Christianity, acknowledge a bishop or abuna selected and consecrated by the Coptic patriarch of Alexandria, make use of a system of law based on the code of Justinian, and have otherwise preserved some share of the civilization of ancient Rome. The Abyssinian empire was at the height of its power in the 6th c., when it extended to the shores of the Red sea, and even included a part of southern Arabia. The Mohammedan conquests drove back the frontier to the limits of the table-land; and since the 7th c., the inhabitants have been engaged in a ceaseless warfare with negro tribes, and with the great Mohammedan powers. They have been surrounded on all sides by hostile races. The tradition of the great power of the Negus lingered in Europe throughout the middle ages; and although separated from the west, the Abyssinians continued to consider themselves one of the Christian and civilized communities. In the 15th c., when on the point of yielding to the invaders, they appealed to the Portuguese for assistance, and it was granted, on condition that they should abandon the rites of the Coptic church, and yield unqualified submission to the pope. The promise was given, and the invaders were driven back. The royal family received the Roman Catholic priests, and professed the tenets of the Latin church. They could not, however, induce the native clergy and the people to follow them; and their adoption of a foreign creed was the first step to the weakening of the royal power, which had been absolute for ages, and which rested on a firm basis of tradition and custom, particularly strong among a

people in the stage of progress attained by the Abyssinians. The royal family still represented are of great antiquity, and are devoutly believed by their subjects to have sprung from Menelek, a son of Solomon and the queen of Sheba. The Abyssinian church certainly dates from the 4th c., when the first bishop, or abuna, settled at Axum. The abuna is appointed and consecrated by the Coptic patriarch of Alexandria, whose supremacy he recognizes. The dissensions introduced by Catholicism in the 16th c. were followed by invasions of the Gallas on the s., and the Turks on the north. The bitterness of the struggle with the latter has been increased by the large contribution exacted by the Egyptian government on the consecration of an abuna, and represented to be a tribute or acknowledgment of suzerainty. A frantic jealousy of the Turks among all ranks of Abyssinians is now one of the most prominent facts in Abyssinian politics. The decay of the royal power in the 16th c. led to a phenomenon frequently repeated both in India and Europe. Just as the Merovingian kings of France became mere titular monarchs, the emperors of Ethiopia became "puppet kings." They were chosen from the royal stock by the great feudatories, but retained the mere insignia of royalty. When the great chiefs could not agree in the selection of a monarch, any one who found himself strong enough would march upon the capital, and place upon the throne one of the royal stock, and in his name retain supreme power, under the name of ras (head or chief), until in turn unseated by a rival adopting the same course. In this way there have been as many as twelve puppet emperors at one time, representing the same number of rival chiefs. The country has in consequence been kept in a perpetual state of revolution. From its great natural features it must, however, be always divided into three leading parts: (1) Tigré, forming the northern promontory of the table-land, where the Geez, a Semitic dialect, is spoken, and through which passes the chief route to the Red sea; (2) Amhara, the middle province, where the language is the non-Semitic Amharic, and in which is Gondar, the capital and seat of supreme power; and (3) Shoa, a southern prolongation of the table-land, where the language is also Amharic, but which is isolated from the rest of the country by intruding tribes of Gallas, an alien race. Among the minor provinces, the chief are Lasta and Waag, Semen, Godjam, and Kuara. In the last century, Gooska, a Galla adventurer, entered Amhara, the central province, and, securing possession of the puppet emperor, assumed the title of ras, and fixed his family in power at Debra Tabor. He was succeeded by his son, and his grandson, ras Ali, who, within the last quarter of a century, confirmed the power of his family by successful military enterprises against the frontier tribes and the great chiefs, and by the marriage of his mother, Waizero Menin, a beautiful and clever woman, to Johannes, the nominal emperor. Such was the success of ras Ali that his supremacy was acknowledged by all the great chiefs except Dejaz Berro of Godjam, and that anarchy seemed about to cease for a time in Abyssinia. It was then for the first time that relations were opened between the central province and England. So early as 1810, while Great Britain was engaged in her struggle with Napoleon, Mr. Salt was sent as her envoy to Abyssinia; but he went no further than Tigré, the ras of which was treated as an independent sovereign. When the power of the French was destroyed in the eastern seas by the capture of the Mauritius, and the destruction of the French settlements in Madagascar, the English government ceased to take any interest in Abyssinia, and Mr. Salt was recalled. One member of the English mission, however, a Mr. Pearce, remained behind, and acquired the confidence of Dejaz Sabagadis, who, in 1816, on the death of Walda Selassie, acquired the government of Tigré. The favor manifested by the prince last named to Englishmen induced the church missionary society to establish a mission within his territories, with which was connected Dr. Gobat, since Anglican bishop of Jerusalem. Tigré was conquered, however, by Dejaz Oubié of Semen; and the missionaries, who remained faithful to the family of the displaced chiefs, were compelled to leave the country. An opening was thus made for the Roman Catholics. They seized the opportunity, and under padre de' Jacobis, a very able Neapolitan, established themselves in Tigré, and succeeded in making a strong impression on the population, among whom their leader became known as the abuna Yacob, and was invested with invested with some share of the veneration bestowed on the native abuna. In consequence of the large sum exacted by the Egyptian government on the consecration of an abuna, the office had remained vacant for many years. To secure the influence of the native church, however, Dejaz Oubié sent a mission to Egypt to obtain the appointment of a new abuna, and the padre de' Jacobis accompanied it, to secure, if possible, the selection of a priest favorable to Rome. He was, however, thwarted by the Coptic patriarch, who appointed Abba Salama, a young man partly educated in the English church mission at Cairo, and who was afterward to be mixed up with the fortunes of king Theodore. Shoa had also been brought into contact with Europe by a Protestant mission in 1838. Two years afterward the same country was visited by maj. Harris; but owing to deplorable jealousy, no permanent result followed. The first direct intercourse with Amhara, the central province, was brought about by Mr. John Bell, an officer of the Indian navy, who had married an Abyssinian, the daughter of a chief, and settled in the country. He had taken service in the army, in which he commanded the matchlockmen, and he had become the most trusted friend and adviser of ras Ali. He liked the country, and thought it could be opened to English commerce and colonization with incalculable advantage to both countries. In 1842 he was visited by Mr. Walter Plowden

a Calcutta merchant, on his way to Europe from India, to whom he communicated his schemes, and imparted his own enthusiasm. The two Englishmen became bosom friends, and remained together five years in Abyssinia. In 1847 Mr. Plowden proceeded to England to lay his views before the English government. He was less successful than he expected; but he convinced lord Palmerston that under ras Ali a central and permanent government had been established in Abyssinia, and that it was desirable to open commercial relations with the country. He was appointed consul, but unfortunately his head-quarters were fixed at Massowah, a sea-port within the Egyptian frontier, a choice which at once excited the suspicion and wounded the vanity of the Abyssinians. On Nov. 2, 1849, a treaty was entered into between ras Ali and Mr. Plowden, and there seemed every prospect of a close connection being established with this country, when all that had been done was rendered useless by the rise of Theodore, and the entire destruction of the power of ras Ali.

In the early part of the century, Kuara, a district of Amhara, s.w. of lake Tzana, was ruled by Dejaz Comfu. The brother of this frontier chief died young, leaving a widow in great poverty, and a son born in 1820, named Kassai, afterward Theodore. She was compelled to seek refuge with her boy in Gondar. There she lived in great obscurity, earning her bread by selling *kosso*, a specific against tape worm. What her rank was is doubtful; and it is not known how far her son was justified in claiming for her descent from the family of the titular kings. Kassai was admitted to a monastery, where he spent many years; but his asylum was afterward attacked by an insurgent chief, and he escaped with difficulty to Kuara. He joined the army of his uncle, then fighting the Turks; and he distinguished himself so much by courage, intelligence, activity, and tact that he obtained a wonderful influence over his fellow-soldiers. Dejaz Comfu died suddenly, and his three sons quarreled. To settle their dispute, Birru Goshu, chief of Godjam, was called in. He entered Kuara, and conquered the best part of it. Kassai, however, resisted him, and at the head of a numerous band of soldiers took refuge among the mountains. He was there attacked by Waizero Menin, the mother of ras Ali, who, as we have seen, had married the titular emperor Johaannes, and who at that time ruled Dembea, the district near Gondar, the capital. Kassai encountered her troops, defeated them several times, and recovered possession of Kuara. Ras Ali thought it prudent to come to terms, recognized him as governor of Kuara, and gave him his daughter in marriage. This alliance did not, however, reconcile Kassai and Waizero Menin. They again quarreled, and again Kassai was victorious. He captured Waizero Menin, and compelled his father-in-law to acknowledge him as ras of Kuara and Dembea. Ras Ali had, however, become alarmed at the power of Kassai, and determined to crush him. As representing the ras, Birru Goshu attacked him with a powerful army, and compelled him again to seek refuge in the mountains of Kuara. In the following year, Kassai entered the field against Birru Goshu, conquered him, and slew him with his own hand. He then marched against ras Ali, and drove him to Debra Tabor, the old stronghold of his family. There he maintained for a time a determined resistance, but he was compelled at last to yield, and he then sought refuge in the country of the Gallas, where he died. Kassai then attacked the Dejaz of Godjam, son of the chief he had killed, and defeated him. The whole of Amhara thus fell into his possession. Having secured the person of the titular emperor, he called upon Dejaz Oubié of Tigré and Semen to pay tribute to him. This demand was refused with insult. Such, however, was the power of this chief that Kassai dreaded to attack him. The rivals met in Feb., 1854, and, to avert bloodshed, agreed to allow the magnates of the empire to decide which had the best right to the throne. The abuna was more under the control of Oubié than Kassai, and the latter felt that the weight of the church would be against him. Padre de' Jacobis, as already mentioned, had acquired considerable influence in Tigré. Theodore made advances to him, and offered that if he, as head of the Latin church, would support his cause, and crown him king, he would compel the people to adopt the Romish rites. Dr. Beke asserts that the padre de' Jacobis accepted the offer. Kassai marched against Oubié, and in Feb., 1855, a battle was fought at Debereskié, in which the latter was captured, as well as the abuna Salama. Kassai, unscrupulously disregarding his promise to the Roman Catholic prelate, now made advances to the abuna Abba Salama, and obtained his consent to acknowledge his descent from Solomon and the queen of Sheba, and to crown him emperor. The conditions exacted were that Kassai should support the Coptic church, and banish the Roman Catholics. A few days after the battle, Kassai was accordingly crowned by the abuna as Theodore of Abyssinia. It was not without reason that this name was chosen. According to an old tradition, a king Theodore was to reign in Abyssinia, conquer the kingdom of Solomon, and restore the ancient glory of Ethiopia. Kassai believed, or affected to believe, himself the man thus announced. He proclaimed himself a descendant of Solomon, but it does not appear that he ventured to ignore the titular king; on the contrary, since his coronation, he is represented as standing in the presence of the latter, naked to the waist, as is the custom of an Abyssinian servant in presence of his master. On the annexation of Tigré, Theodore resolved to attack Shoa, the third great province of the old empire. He invaded the country of the Wollo Gallas, defeated them, and reached Ankobar, the southern capital. The people were frightened by the sudden death of the king, and submitted without a struggle. Theodore now resolved to extend his conquests to the Red

sea, and enter on a crusade against the Turks for the recovery of the sea-board. He had treated up till this time the conquered provinces with great leniency, generally leaving one of the ruling family in power, and to Mr. Bell and Mr. Plowden he extended the same protection they had from ras Ali. He heartily adopted many of their schemes, and was anxious to open up intercourse with England. It was difficult, however, to negotiate with him. He believed himself to possess the same claim to respect as a European monarch, and was kept in perpetual torture by imaginary slights, and more especially by the respect shown to the Turks, whom he regards as barbarians. His vanity and touchiness were aggravated by reverses. The conquest of Shoa had not long been completed when the Dejaz of Godjam and the prince of Tigré rebelled, the latter being supported by the French. At the time when the Roman Catholic missionaries were banished by Theodore, Dr. Krapf and the rev. Martin Flad entered central Abyssinia to found a Protestant mission under the auspices of bishop Gobat of Jerusalem. They proposed to introduce handicraftsmen, not priests, who were to follow their usual avocations, and in addition, merely to read the Scriptures, and distribute copies in the natives languages. The scheme met with Theodore's approval. In April, 1856, the first member of the mission arrived, and others followed. Encouraged by their success, the rev. H. A. Stern afterward went to Abyssinia as agent of the society for promoting Christianity among the native Jews or Falashas, and obtained the consent of the king and abuna to found another mission. He went back to Europe, but returned early in 1863, accompanied by Mr. and Mrs. Rosenthal. A third, known as the Scotch mission, was founded, and all were well received. The first quarrels of Theodore were with the diplomatists. He was indignant at the proposal made by the English foreign office to exercise jurisdiction over criminals in Abyssinia, without granting him reciprocal rights. In Nov., 1855, he was still further irritated by our refusal to receive any embassy from him without an assurance that he was to renounce all idea of reconquering from Egypt the Abyssinian territory of which it had taken possession. At this period our government are accused of having systematically ignored complaints against the Turks. They certainly, without justification, expressed great dissatisfaction with the failure of Mr. Plowden to realize the advantages of intercourse with Abyssinia, although he, in a series of admirable papers, unfortunately not published at the time, proved that it had arisen from causes he could not have anticipated. Personally, Mr. Plowden remained on the best terms with Theodore, and if he had lived, all might have gone well. The consul, however, exposed himself to great risks. He was returning to Massowah from Gondar when he and a company of fellow-travelers were attacked by Garod, a rebel chief. He was wounded, and died of the injury he received. The king and Mr. Bell marched against Garod, and killed him. Garod's brother then killed Bell, and a horrible slaughter of the insurgents ensued. After the death of Mr. Plowden, capt. C. D. Cameron was appointed consul. Theodore was not consulted, and the new consul was coldly received in Oct., 1862. The Egyptians were at the time advancing within the northern frontier of Tigré, and Abyssinian Christians had been subjected to indignities at Jerusalem. Theodore resolved to appeal to the English and French governments, and wrote letters claiming their protection. That to the queen was forwarded to Aden; but unfortunately did not reach London until Feb., 1863, when it was thrust into a pigeon-hole and ignored or forgotten. In the meanwhile consul Cameron was directed to visit Sennaar, on the frontier of Egypt and Abyssinia, to judge of its fitness to become a cotton-producing country. The object of this journey was not explained to Theodore, and he naturally believed it to be a visit by a spy to his enemies the Turks. His suspicions were not allayed when the consul, on his return to Gondar, could produce no answer to the letter. He had received a dispatch, but it simply ordered him to go back to Massowah, and not to interfere with Abyssinian politics. "So your queen," said Theodore, "can give you orders to return to Massowah, but she cannot send a civil answer to my letter to her. You shall not leave till that answer comes;" and the consul was detailed on parole at Gondar. In reply to the French letter, M. Lejean was sent to Abyssinia. A written answer to Theodore was read, in which, as if it had been intended to irritate him, something was said of the protection accorded by the emperor of the French to all Roman Catholics in the east. This aggravated the offense already committed by the French—that of aiding the prince of Tigré. The letter was torn and trampled upon, and M. Lejean, imprisoned for a few days, was ordered off to Massowah. Theodore declared he would no longer be "humbugged by missionaries and consuls like a rajah of Hindustan," and the European residents all felt that a crisis had come. In Oct., 1863, consul Cameron sent letters to Massowah. His messengers were stopped, deprived of their dispatches, and beaten. On the same day Mr. Stern, who happened to pay a visit of ceremony to the emperor, inadvertently gave him offense; and he and his two servants were ordered to be beaten. The servants died the same night. Mr. Stern himself was so seriously hurt that his life was despaired of. His papers were then examined and found to contain remarks derogatory to the emperor. He and Mr. Rosenthal were arrested, and on Nov. 20 they were publicly tried with all the formalities of Abyssinian law—on a charge of having committed the *crimen læsæ majestatis*. Mr. Stern was accused of having circulated the report in Europe of Theodore being the son of a beggar-woman who sold kosso, and of his not being the descendant of Solomon and the queen of Sheba; while Mr. Rosenthal was accused of having

said that the country would fare better under the Turks than Theodore. The prisoners were condemned to death, but the sentence was not carried out. Two days after the trial dispatches arrived for capt. Cameron, but there was no reply to Theodore's letter. Under these circumstances the consul was injudicious enough to apply for permission to leave. He was arrested and thrown into the prison at Gondar with the missionaries, where they remained till the following summer, when they were removed to Magdala. The English government did not seem to interest themselves about the consul; but the case of the missionaries was warmly taken up by lord Shaftesbury and the religious public. A letter of capt. Cameron's was published, in which he said, "No release until an answer is sent to the letter to the queen." The subject was brought before parliament, and the government were compelled to search for this document. It was found in the pigeon-hole where it had been put, indorsed by lord John Russell. It had been written in 1862; it was answered in June, 1864. The reply was intrusted to Mr. Hormuzd Rassam, a native of Mosul, who had been employed in diplomatic service at Aden. The choice of this envoy was most unfortunate—he being, in the eyes of Theodore, a mere Turk, and therefore a spy and an enemy. He was not received till Jan., 1866, and then a second error was committed. Mr. Rassam accepted a large present from Theodore, and did not, or was not enabled to repay it, as was expected, by a gift equal in value, although the necessity of doing so had been fully explained to the government. Theodore then sent the English envoy, who was treated as a mere beggar, to prison with the other captives. This was his first distinct breach of the law of nations. After this period, he conducted himself like a madman: he caused women and children to be tortured, dishonored, and starved in an unheard-of manner. "Out of 3,000,000 inhabitants," says Dr. Blanc in June, 1867, "he has destroyed more than a third by war, famine, and murder." After some unsuccessful attempts to negotiate with Theodore, through Mr. Flad, in the early part of 1867 lord Stanley in April, ordered him within three months to deliver up the prisoners. He took no notice of the communication, and accordingly an expedition was fitted out at Bombay for the invasion of the table-land. The force consisted of upward of 10,000 soldiers. Early in November the advanced brigade landed at Zulla, on the Red sea. From this point the expedition advanced successfully in spite of many difficulties, and, in the beginning of April, 1868, came within sight of Magdala. On April 10, near Magdala, Theodore gave battle to the British forces, and sustained a defeat so decided that he forthwith made submission to the extent of surrendering all the European captives in his power; and on the 13th, Magdala, into which he had retired, was stormed, and with little difficulty was taken possession of by our forces. Neither in the battle nor the assault was there any loss of life on the British side, only a few being wounded; the Abyssinians sustained a loss of 500 killed and 1500 wounded, the most notable among the former being Theodore himself, who was found dead, shot in the head.—See *The British Captives in Abyssinia*, and other works, by C. T. Beke, P.H.D.; the government blue-books; an article in No. 65 of the *Westminster Review*, new series; the works of Harris, Rudolph, Lejean, and Dufton.

THEODORE, of Mopsuestia, a well-known writer of the Syrian church, and especially notable in connection with the controversy of "The Three Chapters," was born of a wealthy and distinguished family at Antioch, in the first half of the 4th century. He was the school-fellow and friend of St. John Chrysostom, and his fellow-pupil under the philosopher and rhetorician Libanius; and he was induced by the earnest exhortation of Chrysostom, to join with him in embracing the monastic life. His theological and scriptural studies were made under Flavian of Antioch and Diodorus of Tarsus; and having received priest's orders, he resided for a time at Antioch, where his learning and eloquence won the highest applause; and afterward at Tarsus, under his old teacher Diodorus. About the year 390, or a little later, he was chosen bishop of Mopsuestia in Cilicia. In 394 he preached in the presence of the emperor Theodosius at Constantinople, on occasion of a synod held in that city. Of his further history little is known; but his literary activity must have been prodigious, if we can judge by the contemporary accounts, and by the number of the works which are ascribed to him, but of which only fragments now remain. The most important of these consisted of commentaries on almost all the books of Scripture, and various polemical writings. A supposed tendency to Pelagian and Nestorian errors was observable in Theodore, and was in part the occasion of the long controversy of the three chapters. This controversy, however, did not arise till long after the death of Theodore, which took place about 427. Considerable fragments of Theodore's commentaries have been published by cardinal Mai in his *Spicilegium Romanum*, and some of his works still exist in Syriac; but by far the greater proportion has been lost.

THEODORETUS (Gr. *Theodoretos*, God-bestowed), a celebrated church historian and theological writer, was born at Antioch about the year 393, and received his name from the circumstance of his being supposed to have been granted as the fruit of earnest prayer, to his parents, who had long been childless. He was educated from early childhood in a monastery, where, among his fellow pupils, were Nestorius and John of Antioch, both afterward celebrated in the controversy which takes its name from the former. He was admitted among the clergy of Antioch; and at a comparatively early age became bishop of Cyrus, a city of Syria. His zeal and eloquence were the theme of

universal praise, and his success in bringing unbelievers and heretics to the church was almost unprecedented. In the controversies on the subject of Nestorius and his doctrines, which followed the condemnation pronounced by the council of Ephesus in 431, Theodoretus for a time took a warm and active interest. The party of Nestorius was with difficulty brought to an accommodation with Cyril of Alexandria, in virtue of which the condemnation of Nestorius by the council was acquiesced in by John, bishop of Antioch. For a time Theodoretus dissented from this condemnation of Nestorius; and he not only expressed these sentiments in a letter addressed to Nestorius himself, but also wrote formally against the celebrated anathemas of Cyril directed against Nestorianism. But he afterward saw the necessity of yielding, and concurred in the deposition of those bishops who still persisted in their rejection of the council of Ephesus. Nevertheless, he by no means fully accepted the views of Cyril; and when, on Cyril's death, the opposition to Nestorianism began to develop, under the turbulent partisanship of his successor in the see of Alexandria, Dioscorus, into the contrary error of Eutychianism, Theodoretus endeavored to induce Dioscorus to abandon his extreme opinions. Failing in the attempt, Theodoretus composed the work which has often figured in modern controversy, on account of the well known passage as to the change of the eucharistic elements which it contains, entitled "*Eranistes or the Many-shaped*." This work was regarded by Dioscorus as a renewal of the Nestorian error, and he accused Theodoretus to Domnus, the new patriarch of Antioch, of that heresy. Theodoretus replied with great moderation; but Dioscorus persisted; and having engaged the imperial court on his side, succeeded in obtaining from the emperor Theodosius II. an order confining Theodoretus within the limits of his own diocese. Meanwhile, the Eutychian controversy reached its height, and Eutyches (q.v.) having been first condemned by Flavian, bishop of Constantinople, in a synod held in 448, was afterward absolved in the celebrated robber-council of Ephesus, under Dioscorus in 449. The latter council not only excluded Theodoretus from its sittings, but formally deposed him from his see; whereupon he was compelled to retire to the monastery at Antioch in which he had received his first education. All this, however, was reversed by the general council of Chalcedon, in 451. Theodoretus did not very long survive his restoration. He died about the year 457. His works fill four volumes folio, reprinted in 10 parts 8vo, by Schulze (Halle, 1768-74), and consist of commentaries on many books of the Old Testament and the whole of St. Paul's Epistles; a *History of the Church*, from 325 to 429 A.D., in five books; *Religious History*, being the lives of the so-called fathers of the desert, a series of most curious and interesting pictures of early ascetic life; the *Eranistes*, a dialogue against Eutychianism; a *Concise History of Heresies*, together with orations and a large number of letters. Of these works, his *History of the Church* is by far the best known, as well as the most important and interesting. See Schulze's edition of *Theodoretii Cyrensis Opera*.

THEODORIC, surnamed **THE GREAT**, the founder of the Ostrogothic monarchy, which comprised Italy, Sicily, south-eastern Gaul, Rhætia, Noricum, Pannonia, and Dalmatia, was born on the banks of the Neusiedler See, to the s. of Vienna, in 455 A.D. His father, Theodemir, was one of the three brothers (the other two were Walamir and Widimir) who, on the death of Attila (453 A.D.), freed their nation from the yoke of the Huns, and being the representatives of the royal line of the Amali, exercised a united sovereignty over it; but the death of Walamir, and the departure to Italy and Gaul of Widimir with a part of the nation, left Theodoric's father sole ruler of the Ostrogoths who remained in Pannonia. Previous to these events, Theodoric had been given as a hostage to the eastern emperor, in accordance with whose directions he had been accustomed to all kinds of athletic and martial exercises, so that after his return (473) home, he was well qualified to fill the post of ruler of his ferocious and valiant kinsmen, which, by the death of his father, was left vacant in 475. In the previous year, the Ostrogoths had obtained parts of Mæsia and Dacia as settlements from the emperor Zeno, and for years they gallantly defended the empire from foreign aggressors, other Gothic tribes included; but the impolitic faithlessness of Zeno produced in revenge the devastation of Thessaly and Macedonia, and subsequently (487) a raid directed on the capital itself. The emperor, to free himself from his troublesome ally, gave him permission to invade Italy, a suggestion gladly adopted by the warlike monarch, who started for Italy in 488; and after forcing his way through the Gepidæ and others who attempted to bar his progress, and gathering recruits on the way, arrived in the summer of 489 on the frontiers of Italy. Odoacer was both forewarned and forearmed; and a desperate conflict between the two powerful armies took place near Aquileia (August 28, 489), distinctly to the advantage of the Ostrogoths. A second and more disastrous defeat was inflicted on Odoacer near Verona (Sept. 27), after which he took refuge in Ravenna; but having again gathered a large force, he was totally routed a third time on the banks of the Adda (August, 490), again blockaded in Ravenna, while the whole of Italy was being subdued; and having at last surrendered, was treacherously murdered (March, 493). Theodoric now assumed the title of *king of Italy*, resisted the claim of suzerainty preferred by the eastern emperor; and with the exception of a victorious campaign against the Franks, to compel them to cease their assaults on the Visigothic dominions, the suppression of a rebellion in Spain against the authority of the

infant monarch, his own grandson Amalric (during whose minority Theodoric administered also the government of the Visigothic kingdom), and an expedition against the robber hordes of the Bulgarians, the whole of his long reign was devoted to the consolidation and development of his new kingdom. His followers only received one-third of the conquered country; the rest was legally secured to the then possessors, and by degrees his barbarous followers were placed upon a footing of harmony with their fellow-subjects. Theodoric made Ravenna his capital; occasionally, when his northern frontier was threatened, removing to Verona. He died in 526. Theodoric holds the very highest rank among monarchs. An uneducated barbarian, and master of a power which even the most formidable of his neighbors, the Franks, could not have long withstood, he showed no desire of conquest; cultivated the friendship and esteem of the surrounding nations; ruled all classes of his subjects with irresistible authority, but with corresponding justice and moderation; zealously promoted agriculture and commerce till Italy again took its old position as the most prosperous country in Europe; and, himself an Arian, exhibited a tolerance of all other sects, which the latter, when their turn for supremacy came, were very far from imitating. The foul blot on his character is the judicial murder of Boëthius (q.v.) and Symmachus, for a supposed connivance with the senator Albinus to restore the authority of the eastern emperor in Italy; but every fact that can be gathered respecting this event bears out the belief that it was the result of a burst of passion, intensified by his extreme, nay, almost morbid, jealousy of Byzantine interference in Italy. The one great error of his administration consisted in his wholly neglecting to assimilate his Ostrogothic subjects with the previous inhabitants, either by a common code of laws, or by common official preferment; for though, under his sway, the evil of this separation did not appear, yet, when the scepter fell to weaker hands, an antagonism necessarily arose between the ruling and the subject races, which was the chief cause of the successful restoration of Byzantine authority in Italy by Belisarius (q.v.) and Narses (q.v.). Theodoric left no son; but his third daughter, Amalaswintha, succeeded him as regent for her son Athalaric; the eldest, Theodiscusa, having become queen of the Visigoths, and the mother of Amalric; and the second, Ostrogotha, the wife of Sigismund, the last king of the Burgundians.

THEODOSIA, or FEODOSIA. See KAFFA, *ante*.

THEODOSIUS, the name of three later Roman emperors.—**THEODOSIUS I.**, surnamed **THE GREAT**, and **THE ELDER**, to distinguish him from his grandson, was of Spanish descent, and was born either at Italica (as Gibbon and those who wish to make him of kin with Trajan maintain), or more probably at Cauca, near Segovia, about 346 A.D. His father, also named Theodosius, was the great general of the Roman empire, who, after freeing South Britain from the savage Caledonians, who roamed over it at their pleasure, and annihilating the formidable rebellion of the Moor Firmus, which threatened to divorce the African provinces from the empire, was conspired against by his many malicious enemies at court, and summarily beheaded at Carthage in 376. Theodosius, who had accompanied his father in his British campaigns, and afterward, by routing the Sarmatians, saved Mœsia from devastation, retired from active service after his father's murder, and occupied himself with the care of his patrimonial lands in Spain. But his many virtues and talents were not forgotten at court; and on the defeat and death of Valens (q.v.), his colleague, Gratianus (q.v.), feeling his inability to sustain alone the cares of empire, summoned Theodosius from his retirement, invested him with the imperial purple, and confided to him, Jan. 19, 379, the administration of Thrace, Dacia, Macedonia, Egypt, and the east, and especially the protection of the empire against the Goths. This last charge called for the full exercise of the new emperor's abilities, for the army at his command dared not face the Goths in the open field; and even when, after the death of their able leader, Fritigern, the Ostrogoths and Visigoths separated, each breaking up into several bands, Theodosius found it most prudent to sow jealousy and dissension among them by promises and bribes, and after a four years' so-called campaign, succeeded in pacifying the Visigoths, the Ostrogoths retreating toward Scythia. The latter returned in 386, their ranks swelled by Scythians, but were totally routed in attempting to pass the Danube, and the survivors were transported to Phrygia and Lydia. In 387, Theodosius undertook to restore to the throne of the western empire Valentinian II. (whose sister, Galla, he married), the brother of Gratian, who had been expelled by Maximus; and after a uniformly successful contest, the usurper was captured and put to death at Aquileia. In 392, the suspicious death of Valentinian, and the elevation of the puppet Eugenius by Arbogastes, the real ruler of the west, again summoned Theodosius to interfere; and after two years of preparation, his motley army of Byzantines, Goths, Alans, and Huns, aided by the treachery of some of Eugenius's generals, gained a complete victory over the Gauls and Germans, who chiefly constituted the army of the west; and the two portions of the Roman empire were again united under one ruler. The union, however, lasted only four months, owing to the death of Theodosius, Jan. 17, 395. Theodosius, though a professor of the orthodox Christian faith, was not baptized till 380, and his behavior after that period stamps him as one of the most cruel and vindictive persecutors who ever wore the purple. His arbitrary establishment of the Nicene faith over the whole empire, the deprivation of civil rights of all apostates from Christianity and of the Eunomians, the sentence of death on the

Manicheans and Quarto-decimans (q.v.), all prove this; though the want of evidence for the direct execution of these severe laws, somewhat modifies the unfavorable impression they produce, and inclines us to believe, that, like the massacre at Thessalonica, they were the result of a sudden access of savage passion, carefully fanned by his interested ecclesiastical advisers. His humiliation before St. Ambrose, bishop of Milan, for the massacre at Thessalonica, was regarded by the church as one of its greatest victories over the temporal power. See AMBROSE.—THEODOSIUS II., surnamed THE YOUNGER, the only son and successor of Arcadius (q.v.), was born 401 A.D., succeeded his father when eight years old, and occupied the throne of the east for 42 years. The chief events of his reign were the invasion of the empire by the Huns under Attila, a war with Persia, renewed efforts to extirpate paganism, and the compilation of the *Codex Theodosianus* (see CODE). The emperor himself was the feeblest of rulers, and was much better adapted for the cowl than for the scepter and sword.

THEOGNIS, an elegiac poet of Greece, about 544 B.C. Plato and Suidas say that he was a native of Megara in Sicily, others, and with probability, think he was born in Megara in Greece. In a conflict at Megara between the aristocracy and the democracy, the latter prevailed, and Theognis, who belonged to the former, lost his landed property and was banished with his wife Argyris; they found refuge in Thebes. It is not known where he died. He left a work consisting of a series of moral sentences in elegiac verse, and containing many striking sentiments.

THEOGONY, the name given in ancient Greece to a class of poems recounting the genealogy of the gods. Musæus (q.v.) is said to have written the earliest theogony; but his work, as well as the theogonies of Orpheus (q.v.) and others, have perished; that of Hesiod (q.v.) being the only one that has come down to us.

THEOLOGY (Gr. *theologia*, lit., a speaking or writing about God) is a term employed to denote the theory of the divine nature and operation. It first occurs in Plato and Aristotle, who understand by it the doctrine of the Greek gods, and of their relation to the world. Homer, Hesiod, Orpheus, etc., are called *theologoi* (theologians), on account of the subject-matter of their verse. But their theology is at the same time called "mythic," to distinguish it from the "physical" theology of the philosophers, which, reversing the mythic order, concerned itself with speculative inquiries regarding the origin of the world and its relation to the gods. In the New Testament, the word theology does not occur, and the idea seems alien to the simplicity of the primitive Christian faith. The Greek Christians originally designated any deep philosophical apprehension of the truths of religion by the term *gnosis* (knowledge), which was opposed to *pistis* (faith), the simple irreflective trust of the majority of humble believers. First during the 3d and 4th centuries the word theology came into use, especially in connection with such of the fathers as defended the doctrine of the deity of the logos. In this sense, the evangelist John and Gregory of Nazianzen were termed *theologians*. During the same period, the word theology was applied to the doctrine of the Trinity. In the century following, its application was widened by Theodoret, who used it to denote the whole circle of theoretical instruction in religion; and finally, Abelard, through his *Theologia Christiana*, gave the word that comprehensive signification it still bears, as expressive not only of a theoretical but also a practical exposition of religious truth. The word divinity is sometimes used to denote the same thing as theology.

THEOPHILUS, one of the most important precursors of Dr. Faust, was, according to the legend, coadjutor-bishop at Adana, in Cilicia. After the death of his bishop, being unanimously chosen successor, he declined the proffered honor, but was shortly afterward, at the instigation of slanderers, deposed from his former office by the new bishop. He now had recourse to a Jew magician, who took him to a midnight meeting of devils, whose chief ordered him to deny Christ and Mary, and to give a bond making over his soul. The result was that next morning he was re-instated in his office and dignities by the bishop; and now, presuming on the support of his confederates, he began to assume a supercilious and domineering manner. But he was soon overtaken with remorse, and, through 40 days' fasting and prayers, prevailed on Mary to intercede with her son for him, and to get back the letter from the devil, which she laid upon the breast of the repentant sinner, as he lay asleep in the church. Theophilus then made a public confession of his crime, told of the goodness of the virgin Mary, and died three days after. This legend, whose origin is traced back to an unknown Greek, of the name of Euty-chianus, was brought, during the 10th c., through an equally unknown Neapolitan priest, named Paulus, to the west, where it very quickly spread far and wide. Before the end of the century it was put into Latin verse by Roswitha, and still better, by the bishop of Rennes, who died in 1123 (printed in the *Acta Sanctorum*, Feb. 4, and in *Hildeberti Tyroneensis et Marbodi Opera*, published by Beaugendre, Par. 1708). Gauthier de Coincy (died after 1236) turned it into a beautiful French poem (printed in *Œuvres de Rutebeuf*, published by Jubinal, 2 vols.); and the Rhenish compiler of the *Alte Passional* admitted it among his legends of Mary (*Marienlegenden*, published by Pfeiffer, Stuttg. 1846). A Dutch metrical version, in the 14th c., was published by Blommaert (*Theophilus*, Ghent, 1836). The first dramatic handling of the subject was in French by Rutebeuf, a distinguished troubadour of the 13th c. (*Œuvres*, published by Jubinal, 2 vols., Par. 1839); then repeatedly during the 14th and 15th c. in Low-German (*Roman-*

tische und andere Gedichte in altplattdeutscher Sprache, published by Bruns, Berl. and Stettin, 1798; *Theophilus, in Icelandic, Low-German, and other Tongues*, by Dasent, Lond. 1845). The legend of Theophilus is also not seldom to be found inserted in large works, and frequent allusions to it occur in Latin, German, Anglo-Saxon, Icelandic, Swedish, French, and even Spanish literature. It has even been pictorially represented in French churches. With the 16th c. it seems to have disappeared. However much the various versions differ from one another in the minor circumstances, the essential traits remain throughout unchanged; that Theophilus made a compact with the devil in order to recover lost property; that he attained his object, but at the same time nothing more (nothing whatever of magic art), and that Mary rescued the repentant sinner. Through this legend of Theophilus, the oldest known instance of a compact with the devil, there runs a lenient spirit (derived from paganism, and which the Roman Catholic church was able to sanction by interposing the virgin Mary), which distinguishes it markedly and essentially from the stern Protestant shape of the devil's compact in the Faust-book, which, with vigorous consistency, requires the consignment of the contracting party to hell.

THEOPHRASTUS, the Greek moralist and naturalist, was born at Eresus in Lesbos, and studied philosophy at Athens, first under Plato, and subsequently under Aristotle. The latter took especial interest in him, and according to a rather incredible legend, altered his original name of Tyrtamus into that of Theophrastus (divine speaker), in compliment to the fluent and graceful speech of his pupil. To Theophrastus, moreover, he bequeathed the presidency of the lyceum, his library, and the original MSS. of his writings. Theophrastus proved a worthy successor of the Stagirite. Under his presidency the lyceum sustained its character, and attracted no fewer than 2,000 disciples, among whom was the comic poet Menander. The kings Philippus, Cassander, and Ptolemy held him in high esteem; and such was the admiration of the people of Athens for him that, when he was arraigned for impiety and triumphantly acquitted, they would have killed his accuser had he not generously interceded. In compliance, however, with the law of Sophocles, which decreed the banishment of all philosophers from Athens, Theophrastus, in 305 B.C., left the city, until the enactment was repealed the very next year by Philo, also a disciple of Aristotle. From that date Theophrastus continued his lectures until his death in 287, at which time he had presided over the academy for 35 years. His birth being unknown, we are ignorant of his age at the time of his death, and conjectures variously give it from 85 to 107 years. On the eve of dissolution, he is said to have complained of the shortness of human life, which ended just when he was about to solve its enigmas. He was accompanied to the grave by the entire Athenian population. He bequeathed his library to Neleus of Seepsis. The great object of his philosophical labors was to develop the Aristotelian system, to explain the difficulties which obscured it, and to fill up the gaps which left it incomplete. Most of the works which he wrote with this object have perished; only the following remain: 1. *Characteres*, in 30 chapters, descriptive of vicious character; 2. *Of Sensuous Perception and its Objects*; 3. A fragment on *Metaphysics*; 4. *Of the History of Plants*, in 10 books, one of the earliest of extant treatises on botany; 5. *Of the Causes of Plants*, in 8 books, of which, however, only 6 remain; 6. *Of Stones*. The best complete edition of Theophrastus is that of Schneider; there are numerous editions of the *Characteres* separately.

THEOPHYLACT, b. Constantinople; was made archbishop of Bulgaria in 1078, and resided at Achrida. He wrote a work on *Education of Princes* for the benefit of his pupil, Constantinus Porphyrogenitus, the son of Michael VII. and the empress Maria. He wrote valuable commentaries on the 12 minor prophets, and on the greater part of the New Testament, compiled chiefly from the works of Chrysostom. He wrote also 75 epistles and several tracts. His works were printed in Greek and Latin at Venice, 4 vols. folio.

THEORY, a word expressing the scientific process of generalization under various aspects.

Theory is, in the first place, opposed to fact, or matter of fact, and signifies that a certain class of facts have been generalized and brought into a single comprehensive statement. It thus corresponds to a principle, general truth, or law of nature. That a half-inflated bladder hung before the fire is expanded till it bursts is a matter of fact; that bodies generally are expanded by heat is the theory or general principle, comprehending the whole class of facts. To give the theory of a fact in this sense of the word is to give its general law; this is also called its explanation, and sometimes its cause. See CAUSE.

Theory, in the next place, is opposed to hypothesis (q.v.). A fact may for a time be referred to a hypothetical or assumed principle; endeavors being meanwhile made to remove the hypothetical character by proving or disproving the principle. The vortices of Descartes was a hypothesis to account for planetary motions; while Newton's view, that gravity might be the cause of these motions, was in the first instance a hypothesis. The Cartesian doctrine was disproved and abandoned; the Newtonian was fully verified, and, ceasing to be a hypothesis, became a theory.

Lastly, theory is opposed to practice. The theory of a subject is the knowledge or explanation of it; the practice is making some use of it. Physiology is theory; physic,

or medicine, is practice. In practical matters there are two modes of procedure which are still further illustrative of the distinction now in hand. The knowledge possessed by a worker in any art may be empirical, experimental, rule-of-thumb—that is, it may be gathered by actual experience in the particular operation. The seaman's knowledge of the prognostics of weather, and the cook's art in boiling and roasting, are usually of this kind. On the other hand the worker's knowledge may be obtained from theory, in other words, from general principles or laws scientifically ascertained; as when the theory of the winds and the law of storms are employed to predict the weather; when the cook roasts and boils according to the known temperature for coagulating albumen; and when a physician prescribes a dietary grounded on a chemical analysis of the food and of the tissues to be maintained. Great caution is required in the employment of such theoretical knowledge in the arts and in practical affairs. It is not enough that the theories are fully established; we must also know all the conditions of the case, so as to allow for every agent operating to produce or to mar the effect. That a cannon-ball should describe a parabola, is a correct theoretical inference from gravity and the laws of motion; but the resistance of the air, a distinct agency, makes it untrue in fact, and therefore misleading in practice. When this resistance is allowed for, the theory is complete, and its application will no longer disappoint the operator. See DEDUCTION.

THEOSOPHY (Gr. *theosophia*, divine wisdom), the name given to a so-called sacred science, which holds a place distinct as well from that of philosophy as from that of theology, even in questions where these latter sciences have the same object with it, namely, the nature and attributes of God. In investigating the divine nature and attributes, philosophy proceeds entirely by the dialectic method, employing as the basis of its investigation the ideas derived from natural reason; theology, still employing the same method, superadds to the principles of natural reason those derived from authority and revelation. Theosophy, on the contrary, professes to exclude all dialectical process, and to derive its knowledge of God from direct and immediate intuition and contemplation, or from the immediate communications of God himself. Theosophy, therefore, so far as regards the science of God, is but another name for mysticism (q.v.), although the latter name implies much more; and the direct and immediate knowledge or intuition of God, to which the Mystics laid claim, was, in fact, the foundation of that intimate union with God, and consequent abstraction from outer things, which they made the basis of their moral and ascetical system. The theosophic system dates from a very high antiquity; and within the Christian period we may number among theosophs, the Neo-Platonists, especially Plotinus, Iamblichus, and Proclus; the Hesychasts of the Greek church; all those of the mediæval Mystics who laid claim to a dogmatical theory; and in later times, the Paracelsists, Bodenstein and Thalhauser, Weizel, Jacob Böhme, and above all, Emmanuel Swedenborg. If we consider one particular view of the philosophic system of Schelling, he also may be assigned to the same school.

TIHERA, or **SANTORIN**, an island on the w. coast of Greece, the most celebrated of the Sporades, in the Grecian archipelago; 41 sq.m.; pop. 12,000. According to Strabo it was 700 stadia n.e. from the Cretan coast, and 200 stadia in circumference. Its origin, given by mythology, is a clod of earth thrown from the ship *Argo*; another legend was that it was produced by submarine fires. Between this island and smaller islands of the group is the crater of an ancient volcano. By an earthquake, B.C. 237, the land now forming the little island of Therasia was torn off, giving it the shape of a horse-shoe. The formation of the coast makes an excellent harbor, which, however, has no bottom reachable by anchors, and vessels tie up to the shore. In 1866–70, a new volcano broke out, with a cone which attained the height of 325 feet. The portion which in ancient times was covered with lava, ashes, and pumice-stone, is now a cultivable surface, producing barley, wine (the annual production of which is about 1,750,000 gallons), and cotton, which does not require planting every year. It contains an extensive ledge of fine marble which has been undisturbed by volcano or earthquake. The principal industry is ship-building, and the inhabitants are Greeks.

THERAMENES, d. B.C. 404; b. Greece. In 410 he was at the battle of Cyzicus, and in 408 at the siege of Chalcedon and the capture of Byzantium. He was one of the generals at Arginusæ in 406, and succeeded in saving the lives of the 6 generals condemned for not rescuing the drowning crews. He went on an embassy to Lacedæmon during the siege of Athens by Lysander, and finally, after passing three months with the latter, made peace in behalf of the Athenians. He had an understanding with the exiles of the Athenian oligarchy, and was one of the 30 tyrants. He was put to death by the partisans of Critias, whose measures he had opposed.

THERAPEUTÆ, a pious "Jewish" sect, mentioned in a book ascribed to Philo, as living chiefly on the lake Mareotis, near Alexandria, but as having also numerous colonies in other parts of the world. They are described as in many respects like the Essenes (q.v.). Like them, they lived unmarried in a kind of monastery, were very moderate with regard to food and dress, the latter consisting in a white garment; prayed at sunrise, their face turned to the sun; studied much in the Scriptures—which they explained allegorically—and in other "ancient books," and were principally opposed to slavery. The chief differences between these two "sects," as they are described to us, consisted in the Therapeutæ simply living a life of contemplation, while the Essenes fol-

lowed many occupations, such as agriculture, arts, etc.; the latter lived together, while the Therapeutæ lived separately in their cells; the Essenes not only took an interest in other human beings, but actively assisted them; while the Therapeutæ, who also, before they entered the brotherhood, divided their property among their relatives, contrary to the "common treasure" of the Essenes, kept in utter ignorance of the outer world. Again, the Therapeutæ knew none of the divisions which marked the degrees of initiation among the Essenes, but they held the temple at Jerusalem in much higher veneration than the latter; the Therapeutæ brought up boys to the brotherhood, while the Essenes only recruited themselves from grown-up people. One of the chief characteristics of the Therapeutæ was also the religious meals they used to hold in common on every seventh Sabbath; the Essenes having two such sacred meals daily. Many and striking are also the analogies offered by their mode of life and their doctrines to those of the Pythagoreans. Neither partook, e.g., of animal food or wine, and both admitted women to their assemblies, which were mostly concluded with hymns; and they both held the number seven sacred. Many theories have been broached in regard to this mysterious sect. One of the most plausible notions is the one—latterly much discussed—of the whole book *De Vita Contemplativa*, which treats of this sect, being falsely attributed to Philo. It is rather believed to be the work of an early Christian, intended to idealize the life of Christian monasticism and asceticism of the first centuries. See **ESSENES**.

THERAPEUTICS (Gr. *therapeuo*, I heal) is that division of the science of medicine which treats of the various actions of remedies upon the diseased animal system, or the means by which nature may be aided in her return to health.

THERAPIA, or **TARAPIA**, a small Turkish town of about 3,000 inhabitants, is situated on the Bosphorus, 21 m. n.e. of Constantinople, at the head of a large and beautiful bay of the same name. It is one of the most charmingly picturesque spots in the neighborhood of the Turkish capital, and all summer has a climate deliciously cool. *Therapia* is the residence of the French and English embassies, and many of the Frankish merchants have villas here.

THERAPONIDÆ, a family of acanthopterous fishes, allied to *percidæ*, from which they are distinguished by having 6 instead of 7 branchiostegal rays. The scales in some are ctenoid, in others cycloid. Some are fresh-water fishes. None are British. Some are found in the lakes and rivers of North America.

THERESA, SAINT. See **TERESA**, *ante*.

THERESIOPEL, more commonly called **MARIA-THERESIOPEL** (Hung. *Szabadka*), an important town in the Hungarian county of Bacs, 24 m. w.s.w. of Szegedin, on the Palitsch lake. It is well built, but unpaved; contains numerous important buildings, as the churches, gymnasium, and the great barracks. Manufactures of leather and shoes, linen-weaving, dyeing, the cultivation of tobacco and fruits, together with the rearing of cattle, are the chief branches of industry. Pop. '69, 56,323.

THERIACA (Gr. *ther*, a wild or a venomous animal), a medicine in the form of an electuary, supposed to be an antidote to the poison of venomous animals. It was invented by Andromachus of Crete, physician to the emperor Nero, and was described in a poem, preserved in Galen's work, *De Antidotis*. This theriac was a mishmash of about 70 ingredients, some of them quite inert, and others antagonistic to one another. Yet it continued in repute until recent times, and it is not long since in Venice, Holland, France, and other places, the druggists had to prepare the compound with certain solemnities in the presence of the magistrates. The term *theriaca* was applied to various compounds of a similar nature, and *theriac* and *theriacal* became synonymous with medicinal. The English word *treacle* is a corruption of *theriacal*, and originally meant an electuary, or compound syrupy medicine (e.g., Venice treacle = the theriac of Andromachus); and it was applied to molasses from the similarity in appearance.

THERMIDOR, i.e., the "hot month," formed, in the calendar of the first French republic, the 11th month, and lasted from July 19 to Aug. 18. The 9th Thermidor of the Republican year 2 (July 27, 1794) is historically memorable as the date of Robespierre's fall, and the termination of the Reign of Terror. The name Thermidorians was given to all those who took part in this fortunate *coup d'état*, but more particularly to those who were desirous of restoring the monarchy.—See Duval's *Souvenirs Thermidorians* (2 vols., Par. 1844.)

THERMO-DYNAMICS, or the **DYNAMICAL THEORY OF HEAT**, though literally merely the science of the relations of heat and work, is now very generally employed to denote the whole science of **ENERGY**. See **FORCE**. We propose in this place to give a general sketch of this grand modern generalization, supplementary to what will be found in the article just referred to; but, for the sake of continuity, we must repeat a little of what was there given, though in a somewhat different form.

Energy is strictly defined as the power of doing work (q.v.), and is of one or other of two kinds—*potential* or *kinetic*. A raised weight, a wound-up spring, gunpowder, and the food of animals, are instances of stores of potential energy. A missile in motion, wind, heat, and electric currents are instances of kinetic energy. Sound, light, and other forms of wave motion (see **WAVE**), are all instances of mixed potential and kinetic energy.

The modern theory of energy contemplates its

CONSERVATION,
TRANSFORMATION, and
DISSIPATION.

The CONSERVATION OF ENERGY is the statement of the experimental fact, that energy is, like matter (q.v.), indestructible and uncreatable by any process at the command of man.

The TRANSFORMATION OF ENERGY is the statement of the experimental fact, that any one form of energy may in general be transformed wholly or partially into any other form. This used to be known as the CORRELATION OF FORCES. But it is subject to the condition derived from the first fact, that the portion transformed retains its amount unchanged. It is also subject to the law of DISSIPATION, or degradation, which is a statement of the experimental fact, that energy generally tends at every transformation to at least a partial transformation into heat; and that, once in that form, it tends to a state of uniform distribution, in which no further transformation is possible.

The original energy of the universe, therefore, though still of the same amount as at creation, being in a state of ceaseless transformation, has been in great part frittered down into heat, and will at length take wholly that final form.

The history of the grand discoveries which are briefly summarized in these few lines, has been much discussed of late—especially in the *Philosophical Magazine*—and is now pretty clearly ascertained.

Newton took the first great step. In a scholium to his third law of motion (q.v.), he lays down in a few clear words the conservation of energy as the embodiment of the experimental results known in his day with reference to forces and visible motions. Part of this statement of Newton's was afterward reinvented under the name of conservation of vis-viva; but all that Newton really wanted to enable him to complete the conservation of energy was an experimental knowledge of the nature of heat, electricity, etc. That heat is motion of some kind, not matter, and that the laws of its communication are the same as those of the communication of visible motion, was experimentally proved at the very end of last century by Davy. Rumford had almost completed a proof a year or two before; but he had also made a very fair attempt to determine the "mechanical equivalent" of heat—i.e., the quantity of heat which is equivalent to a given amount of mechanical work. That there is such an equivalent is at once evident by looking at Davy's discovery in the light of Newton's scholium already referred to. But though the dynamical theory of heat was thus really founded in 1799, it was not generally received. The first to recall attention to it was Séguin, nephew of the celebrated Montgolfier (from whom he states that he derived his views), who, in 1839, distinctly enunciated the equivalence of heat and mechanical work, and sought to prove by experiment that heat disappears, or is put out of existence, in the production of work from a steam-engine.

In 1843 Mayer published a short note, in which he enunciated the conservation of energy as a metaphysical deduction from the maxim, *Causa æquat effectum*. He made no experiments to prove this general statement, but he made a calculation of the mechanical equivalent of heat from the specific heats of air—assuming that when heat is produced by compression, its amount is the equivalent of the work spent in compressing. His result was erroneous, because his data were imperfect. But it appears that his assumption, quite unwarranted as it was, is really very nearly true for air.

In 1843 Colding, led also by some metaphysical speculations, propounded the doctrine, but endeavoured to base it upon actual experiments.

Finally Joule (q.v.), also in 1843, published an experimental determination of the mechanical equivalent of heat (770 foot pounds as the work required to heat a pound of water one degree Fahr.), which is within half per cent of the most trustworthy results since obtained. Joule had been, since 1840 at least, making quantitative determinations of equivalence between various forms of energy; and was led to propound the general law of conservation of energy by the only legitimate process—viz., experiment, as contrasted with metaphysical assertions of what ought to be. The complete foundation of the science on a proper basis is thus due to him; though, as we have seen, portions of it were established thoroughly by Newton and by Davy.

Before we consider what are the principal features of the theory as now developed, it is necessary to refer to the admirable investigations of Fourier and Carnot, which, though in some respects defective, must be considered as real advances. Fourier's great work, *Théorie de la Chaleur*, is devoted to the laws of conduction and radiation, i.e., to the dissipation, of heat, and is one of the most remarkable mathematical works ever written. Carnot's work, *Sur la Puissance Motrice du Feu*, is the first in which any attempt is made to explain the production of work from heat. It is unfortunately marred by his assumption that heat is a material substance, though it is only fair to say that he expresses grave doubts as to the truth of this hypothesis.

(We borrow our notice of Carnot from a paper by sir W. Thompson (q.v.) in the *Transactions of the Royal Society of Edinburgh*, 1849.)

He begins his investigation by premising the following correct principle, sadly neglected by many subsequent writers: "If a body, after having experienced a certain

number of transformations, be brought identically to its primitive physical state as to density, temperature, and molecular constitution, it must contain the same quantity of heat as that which it initially possessed." Hence he concludes that when heat produces work, it is in consequence of its being *let down* from a hot body to a cold one, as from the boiler to the condenser, of a steam-engine. His investigation, though based on an erroneous hypothesis, is extremely ingenious, and forms the foundation of the modern theory. We give a sketch of it, preparatory to our account of the present state of the theory, and for this purpose we choose a somewhat hypothetical case, as simpler than the most common practical one. This the case of a piston working air-tight in a cylinder closed at the bottom.

Suppose we have two bodies, A and B, whose temperatures, S and T, are maintained uniform, A being the warmer body, and suppose we have a stand, C, which is a non-conductor of heat. Let the sides of the cylinder and the piston be also non-conductors, but let the bottom of the cylinder be a perfect conductor; and let the cylinder contain a little water, nearly touching the piston when pushed down. Set the cylinder on A; then the water will at once acquire the temperature S, and steam at the same temperature will be formed, so that a certain pressure must be exerted to prevent the piston from rising. Let us take this condition as our starting-point for the cycle of operations. 1. Allow the piston to rise gradually; work is done by the pressure of the steam, which goes on increasing in quantity as the piston rises, so as always to be at the same temperature and pressure. And *heat is abstracted from A*, namely, the latent heat of the steam formed during the operation. 2. Place the cylinder on C, and allow the steam to raise the piston further. More work is done, more steam is formed, but the temperature sinks on account of the latent heat required for the formation of the new steam. Allow this process to go on till the temperature falls to T, the temperature of the body B. 3. Now, place the cylinder on B; there is of course no transfer of heat; because two bodies are said to have the same temperature when, if they be put in contact, neither parts with heat to the other. But if we now press down the piston, we do work upon the contents of the cylinder, steam is liquefied, and the latent heat developed is at once absorbed by B. Carry on this process *till the amount of heat given to B is exactly equal to that taken from A* in the first operation, and place the cylinder on the non-conductor C. The temperature of the contents is now T, and the amount of caloric in them is precisely the same as before the first operation. 4. Press down the piston further, till it occupies the same position as before the first operation; additional work is done on the contents of the cylinder, a further amount of steam is liquified, and the temperature rises.

Moreover, *it rises to S exactly*, by the fundamental axiom, because the volume occupied by the water and steam is the same as before the first operation, and the quantity of caloric they contain is also the same—as much having been abstracted in the third operation as was communicated in the first—while in the second and fourth operations the contents of the cylinder neither gain nor lose caloric, as they are surrounded by non-conductors.

Now, during the first two operations, work was done by the steam on the piston; during the last two, work was done against the steam; on the whole, the work done by the steam exceeds that done upon it, since evidently the temperature of the contents, for any position of the piston in its ascent, was greater than for the same position in the descent, except at the initial and final positions, where it is the same. Hence the pressure also was greater at each stage in the ascent than at the corresponding stage in the descent; from which the theorem is evident.

Hence, on the whole, a certain amount of work has been communicated by the motion of the piston to external bodies; and the contents of the cylinder having been exactly restored to their primitive condition, we are entitled to regard this work as due to the caloric employed in the process. This, we see, was taken from A, and wholly transferred to B. It thus appears that *caloric does work by being let down from a higher to a lower temperature*. And the reader may easily see that if we knew the laws which connect the pressure of saturated steam, and the amount of caloric it contains, with its volume and temperature, it would be possible to apply a rigorous calculation to the various processes of the cycle above explained, and to express by formula the amount of work gained on the whole in the series of operations, in terms of the temperatures (S and T) of the boiler and condenser of a steam-engine, and the whole amount of caloric which passes from one to the other.

Though the above process is exceedingly ingenious and important, it is to a considerable extent vitiated by the assumption of the materiality of heat which is made throughout. To show this, it is only necessary to consider the second operation, where *work is supposed to be done* by the contents of the cylinder expanding *without loss or gain of caloric*, a supposition which our present knowledge of the nature of heat shows to be incorrect. But it is quite easy, as seems to have been first remarked by J. Thomson in 1849, to put Carnot's statement in a form which is rigorously correct, whatever be the nature of heat. J. Thomson says: "We should not say, in the third operation, 'Compress till the same amount of heat is given out as was taken in during the first.' But we should say, 'Compress till we have let out so much heat that the further compression (during the fourth stage) to the original volume may give back the original temperature.'" It is but bare justice, however, to acknowledge that Carnot himself was by no means satis-

fied with the caloric hypothesis, and that he insinuates, as we have already seen, more than a mere suspicion of its correctness.

If we carefully examine the above cycle of operations, we easily see that they are *reversible*, i.e., that the transference of the given amount of caloric back again from B to A, by performing the same operations in the opposite order, requires that we expend on the piston, on the whole, as much work as was gained during the direct operations. This most important idea is due to Carnot, and from it he deduces his test of a *perfect engine*, or one which yields from the transference of a given quantity of caloric from one body to another (each being at a given temperature) the greatest possible amount of work. And the test is simply that *the cycle of operations must be reversible*.

To prove it, we need only consider that, if a heat-engine, M, could be made to give more work by transferring a given amount of caloric from A to B, than a reversible engine, N, does, we may set M and N to work in combination, M driven by the transfer of heat, and in turn driving N, which is employed to restore the heat to the source. The compound system would thus in each cycle produce an amount of work equal to the excess of that done by M over that expended on N, without on the whole any transference of heat; which is of course absurd.

The application of the true theory of heat to these propositions was made in 1849, 1850, and 1851 respectively, by Rankine, Clausius, and sir W. Thomson. Rankine employed a hypothesis as to the nature of the motion of which heat consists, from which he deduced a great many valuable results. Clausius supplied the defects of Carnot's beautiful reasoning; accommodating it to the dynamical theory by a very simple change, and evolving a great number of important consequences. But by far the simplest, though at the same time the most profound, writings on this subject, are those of sir W. Thomson, to be found in the *Transactions of the Royal Society of Edinburgh*; and these must be consulted by any reader who desires to have a clear statement and proof of thermo-dynamical laws, not complicated by unnecessary hypotheses or formulae, and yet perfectly general in its application. See also Tait's *Thermo-Dynamics* (2d ed. 1877).

In its new form, thermo-dynamics is based on the two following laws:

Law I. (Davy and Joule.) *When equal quantities of mechanical effect are produced by any means whatever from purely thermal sources, or lost in purely thermal effects, equal quantities of heat are put out of existence, or are generated.*

Law II. (Carnot and Clausius.) *If an engine be such that, when it is worked backward, the physical and mechanical agencies in every part of its motions are all reversed, it produces as much mechanical effect as can be produced by any thermo-dynamic engine, with the same temperatures of source and refrigerator, from a given quantity of heat.*

The proof of this second law differs from that of Carnot (already given as regards reversible engines) by being no longer based on the supposition of the materiality of heat, but on the following axiom, in some of its many possible forms: It is impossible, by means of inanimate material agency, to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects. It will be easily seen that the pair of engines (one reversible) before mentioned would, if worked in combination, form a perpetual motion; and, besides, would constantly transfer heat from a colder to a warmer body.

One of the immediate and most important deductions from these principles is—that only a fraction of the heat employed in any engine is converted into useful work (the remainder being irrecoverably lost). This fraction was shown by Thomson to be capable of expression as

$$\frac{S-T}{T};$$

where S and T are the temperatures of the source and condenser, *measured from the absolute zero* of temperature. See HEAT. Thus, an air-engine, in which a far greater range of temperature can be safely used than in a steam-engine, employs effectively a much larger portion of the heat supplied to it; and there is no doubt that air-engines would supersede steam-engines, if we could get a material capable of enduring the great heat required.

THERMO-ELECTRICITY treats of the currents that arise from heating the junction of two heterogeneous conductors. Such currents can be obtained in many ways, but we shall here simply indicate the more important.

Thermal Currents with one Metal.—Take a copper wire, cut it in two, and fix each half in one of the binding screws of a galvanometer. Heat one of the free ends to redness, and press it against the other, and a current will be generated, passing at the junction from the hot to the cold end, as shown by the deflecting needle. In almost all cases where portions of the same metal at different temperatures are pressed together a current is produced, the direction of which depends on the metal, and even on the structure of the same metal.

Currents are also obtained when two portions of the same metal or piece of metal have different structures, and the point where the two structures meet is heated. If, for instance, one piece of wire be hard-drawn and the other part annealed, when the seat of change from the one to the other is heated, a current is produced. Or if the whole be annealed, and one part of it be hammered, the hammering makes the other part harder, and the current, when the junction is heated, passes from the soft to the

hard part. The direction of the current differs with different metals in these circumstances. Even the difference of structure introduced by the twisting of a portion of a wire causes a current to flow when the wire is heated in the vicinity of the twist. Thus, when a knot is tied on a platinum wire, or when part of it is coiled into a spiral, a current passes always toward the knot or coil when the flame of a spirit-lamp is directed on a portion of the wire near the knot or spiral. The twisting, in this case, acts as hardening or hammering would do. By running the flame of a spirit lamp along a metal, it frequently happens, more especially if it be of a crystalline structure, that currents are produced at certain points. These points are supposed to indicate a change in structure. If a bar of fused antimony have its ends connected with a galvanometer, and examined in this way, *neutral points* are generally found. The flame of a lamp generates a current near these points, always passing toward the point, and changing in direction with the change of the side on which the flame is applied. Bismuth shows neutral points, but the current always goes from the cold to the hot part across the neutral point. In bars of those metals which are crystallized regularly and slowly, no neutral points are found.

Thermal Currents with two Metals.—A current is always obtained when the point of junction of any two metals is heated. The two metals which show this property in the greatest degree are bismuth and antimony. When a bar of antimony, A (fig. 1), is soldered to a bar of bismuth, B, and their free extremities are connected with a galvanometer, G, on the junction being heated, a current passes from the bismuth to the antimony, as shown in the figure. When S is chilled by applying ice, or otherwise, a current is also produced, but in the opposite direction. Such a combination constitutes a thermo-electric pair. Applying the same mode of explanation to this pair that we apply to the galvanic pair (see GALVANISM), bismuth is positive within and negative without the pair, antimony negative within and positive without the pair. Bismuth thus forms the negative pole, but positive element; antimony the positive pole, but negative element of the pair. The metals may be classed in thermo-electric just as in electro-chemical order. The following table gives them in this order, the direction of the arrow showing how the current goes within the pair. The order and numbers in this

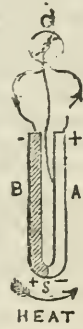


FIG. 1.

table, which are for temperatures between 40° and 100° Fabr., are those given by Dr. Mathiessen. For other temperatures, the table would be different for several of the metals.

It will be seen, that metals like bismuth and antimony, which have a crystalline structure, are best suited for a thermo-electric pair. Tourmaline, when heated, shows an opposite electricity at each end. If it had a low conducting power like the metals just named, we might expect from it a thermo-electric current instead of mere polarity. It is probable that the crystalline structure, however, accounts for the appearance of electricity in both cases.

	HEAT.	
Bismuth, 23	→	
Cobalt, 9		
Potassium, 5.6		
German Silver, 5.2		
Nickel, 5		
Sodium, 3.5		
Mercury, 2.5		
Aluminum, 1.3		
Magnesium, 1.2		
Lead, 1.03		
Tin, 1		
Copper, 1		
Platinum, .7		
Silver, 0		
Gas Coke, -.05		
Zinc, -.2		
Iron, -.5		
Antimony, -10		
Tellurium, -179	←	
	COLD.	

Thermo-electric Pile or Battery.—One bismuth-antimony pair is of very little power. To increase this, several pairs are associated together, and the same tension-arrangement is adopted as in a galvanic battery. The heat in this case must be applied only to one row of soldered faces. The current depends on the difference of temperature of the two sides. When a strong current is required, the one series must be kept in ice, or in a freezing mixture, while the other is exposed to heat radiating from a red-hot plate of iron. As in the galvanic pair, the electro-motive force is proportionate to the number of pairs; the size of the bars, like the size of the galvanic plates, merely aiding to diminish the resistance. The electro-motive force of a thermo-electric battery is small; according to Dr. Mathiessen, that of 25 bismuth-tellurium pairs equals one cell of Daniell's battery, when the one series is kept at 32° Fabr. and the other at 212° Fabr. In consequence of the low electro-motive force of the thermo-electric battery, the galvanometer to be used with it must introduce as little resistance as is consistent with the best effect on the needle. Hence special galvanometers are used, in which the coil wire is short (200 turns) and thick ($\frac{1}{8}$ inch); these are called thermo-galvanometers.

When a great number of pairs are formed into a battery, they may be conveniently arranged as in fig. 2, which shows one of 30 pairs. The odd faces, 1, 3, 5, etc., are exposed on the one side, and the even faces, 2, 4, 6, etc., on the other. The terminal bars are connected with the binding screws *n, p*. The interstices of the bars are filled with insulating matter (gyp-um) to keep them separate, and the frame in which the whole is placed is of non-conducting matter. Such a pile in conjunction with a thermo-galvanometer (see GALVANISM) forms the most delicate thermometer for radiant heat, and is generally called a *thermo-multiplier*. When placed

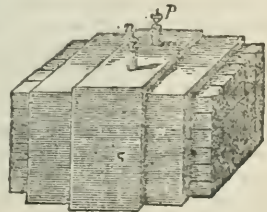


FIG. 2.

in a room, the temperature of which is equable all round, no current is produced, but if heat be radiated more on one side than another, a current ensues. If the hand, for instance, be brought near on the one side, a current indicates its radiant power; or if a piece of ice be brought near, a current is also shown, but moving in the opposite way.

Thermal Effects produced by the Galvanic Current.—As heat or cold produces a current at the junction of two dissimilar conductors, we should expect that if a galvanic current be made to pass through the junction, heat or cold would follow, and such is found to be the fact. When a current from a voltaic cell passes through a system of three rods of bismuth, antimony, and bismuth, at the junction where the current passes from bismuth to antimony, cold is produced; and at the other, from antimony to bismuth, heat. If, for instance, water be placed in a hollow at either junction, cooled to 32° Fahr, it will become frozen when the current passes from the bismuth to the antimony. When the junction of these two metals is put into the bulb of an air thermometer, so that a current can be sent through it in either way, the air expands when the current goes from antimony to bismuth, but contracts when it goes in the opposite way. See THERMO-ELECTRICITY, where the theory of energy is applied to the explanation of the various phenomena.

Seebeck was the discoverer (1821) of thermo-electricity; Nobili invented the thermo-electric pile (1834); Peltier (1834) first observed the thermal effects of galvanic currents at the junction of heterogeneous conductors.

THERMO-ELECTRICITY AND THERMO-MAGNETISM. If the ends of an iron wire be attached by twisting or soldering to the extremities of the copper wire of a galvanometer, and one of these junctions be heated, the galvanometer indicates the passage of a current in the circuit in a direction from copper to iron through the heated junction. The first application of the theory of energy to this phenomenon is of course as follows: Since heating the junction produces the energy of the current, part of the heat must be expended in this process; though it is of course entirely recovered as heat in the circuit, if the current be not employed to do external work. The existence of the current from copper to iron is thus associated with the cooling of the junction; and it had been experimentally shown by Peltier, that if an electric current be passed through a circuit of iron and copper, originally at the same temperature throughout, it produced cold when passing from copper to iron, and heat when passing from iron to copper. If the two junctions be maintained each at a constant temperature, a constant current passes from the warmer to the colder junction through the iron wire; and by the conservation of energy, the heat developed in the circuit (together with the equivalent of the external work done, if the current be employed to drive an electro-magnetic engine) is equal to the excess of the heat absorbed at the warmer junction over that given out at the colder, precisely as in the case of a heat-engine. So far the process presents no difficulties. But it was discovered by Cumming in 1823, that not only is the strength of the current not generally proportional to the difference of temperatures of the junctions, but that if the difference be sufficiently great, the current may, in many cases, pass in the opposite direction. Thus, in the copper-iron circuit, at the temperature 300° C. of the hot junction, the current passes through it from iron to copper. Thomson (Bakerian lecture—*Phil. Trans.* 1855—"On the Electrodynamic Properties of Metals") applied the principle of energy to this case, and derived from it the conclusion, that one of three things must happen, the most unexpected of which was found by experiment to be the actual one—viz., the startling result, that *a current passing in an iron bar or wire from a hot to a cold part produces a cooling, but in copper a heating effect.* This very remarkable discovery, which, taken in connection with that of Peltier, gives the key to the whole subject of thermo-electricity, has been made the subject of a valuable experimental investigation by Le Roux (*Annales de Chimie*, 1867).

The theory of such phenomena (and of others far more complex, involving, for instance, crystalline arrangement), in complete accordance with the conservation of energy, has been given by Thomson (*Trans. Royal Soc. Edin.* 1854); but it would be inconsistent with the character of this work to enter into any details on so abstruse a subject. A similar remark must be made regarding his application of the principle to the subject of thermo-magnetism, or the relation of the magnetizability of various substances to their temperature; one or two of his results may, however, be mentioned. Thus, iron at a moderate or low red-heat experiences a heating effect when allowed to approach a magnet, and a cooling effect when slowly drawn away from it; while in cobalt, at ordinary temperatures, exactly the opposite effects are produced. Similar effects are in general produced when a doubly-refracting crystal is turned in the neighborhood of a magnet.

THERMOMETER (Gr. literally, *heat measurer*), a term which, in spite of its derivation, is usually restricted to instruments which measure temperature (see HEAT) by the *expansion* of bodies. Like that of the telescope and microscope, and many other valuable pieces of philosophical apparatus, its early history is very obscure. There are various claimants who seek to share at least a part in the credit of its invention; and they agree pretty well in referring it to somewhere in the beginning of the 17th century. We shall not waste space in endeavoring to settle such matters of history, but proceed at once to

a description of the forms of the instrument now most commonly used; after which we shall say a few words about the actual value of their indications, and finish by a rapid sketch of a few other instruments also adapted for the measurement of temperature, but not usually known by the name of thermometer.

Let us commence with the ordinary spirit-thermometer, as it is called; where the indications are given by the expansion of a quantity of alcohol which fills entirely a glass bulb, and partially a narrow tube attached to it.

To construct such an instrument, a capillary tube is selected, of as uniform a bore as possible. The easiest method of testing its uniformity is to introduce a column of mercury, about an inch long, into the tube, and gradually move it along by inclining the tube, carefully measuring the length of the column in each of its successive positions. It is obvious that the column will be longer the smaller is the mean section of the portion of the tube occupied at any time by the drop of mercury. If considerable differences of length are found, the tube is rejected at once. The best tubes are those which, if showing any change, taper very slowly but nearly uniformly from one extremity to the other; a defect which can easily be allowed for in the subsequent graduation of the instrument. A bulb is blown on one end of the selected tube; large, if the instrument is meant to be very delicate; small, if a common instrument is to be made, or one which will work through a great range of temperature. The bulb is heated to expand the contained air, and then the open end of the tube is plunged into alcohol, usually tinged with coloring matter, for greater visibility. As the bulb cools, the atmospheric pressure on the alcohol in the vessel forces some of it into the stem, and perhaps a little into the bulb. The tube being then inverted, a few dextrous taps suffice to shake the greater part of the alcohol into the bulb. The lamp is again applied, with caution, until the alcohol boils, and the rapidly escaping vapor drives the air almost entirely from the tube, whose open end is immediately plunged again into the colored spirit. Unless the stem be nearly 40 ft. in length—and thermometers have been made by Forbes (q.v.) of a length approaching to this for the measurement of underground temperature—the alcohol fills the whole of the ball and stem as soon as the glass has cooled. The bulb is again cautiously heated, so that, by the expansion of the spirit, such a portion may be expelled, that, when the whole has again cooled, the level of the liquid in the tube may stand near some point previously determined on with reference to the particular employment for which the instrument is destined. Finally, the lamp being again applied to the tube, near the upper surface of the liquid, that portion of the spirit is again made to boil; and while the vapor keeps the free end of the tube clear of air, that end is hermetically sealed; and the glass-blower's part of the work is done. A somewhat similar, but more difficult process has to be gone through, if other liquids, such as ether, sulphuric acid, mercury, etc., are employed to fill the bulb; each of these liquids having its own special use in certain philosophical inquiries, as we shall presently see. It only remains that the instrument be *graduated*, so that some definite information may be given by its indications.

In the older thermometers, the scale was arbitrary, so that no comparable readings could be taken by means of different instruments. In the finest modern instruments, also, the scale is usually quite arbitrary, being, in fact, engraved on the tube during the process of calibration above described. But then, by careful observation, certain definite temperatures are measured in terms of this arbitrary scale, so that the value of a degree and the position of some definite zero-point are determined for it, and the result engraved on the tube. These numbers enable us, by an easy calculation, to reduce the observed reading of the fine instrument to its equivalent in some of the standard scales.

At present, we assume, what is very nearly true for mercury at least, that equal increments of bulk correspond to equal increments of temperature. All, then, that is necessary is to fix two definite temperatures, and assign their positions on our scale. Water being one of the most common bodies in nature, and being everywhere easily obtainable in a state of great purity, is usually employed; and its *freezing* and *boiling* points are taken as the definite points. The temperature of freezing water or of melting ice is almost absolutely fixed, for (see HEAT) pressure alters it only very slightly. It is otherwise with the boiling-point of pure water, for this is considerably raised by increase of pressure; so much so, in fact, that if the barometer be not attended to, an error of several degrees is possible. Hence we must define the particular pressure, usually 30 in., at which the boiling-point is to be determined. The thermometer, constructed (so far) as above described is to have its bulb, and nearly the whole of the portion of the stem which contains liquid, immersed in pounded ice, from which the melted portion is freely trickling; and when the level of the spirit has become stationary, its position, the *freezing-point*, is marked on the tube. Similarly, the barometer standing at 30 in., the bulb is inclosed in the steam immediately above the surface of water freely boiling. We thus obtain the *boiling-point*. It only remains that we decide by what numbers these points shall be indicated, because (on account of the nearly uniform expansion of mercury) then the remaining divisions can be at once filled in by dividing the interval between them into equal parts, or, if necessary, allowing for a slight taper in the tube. The only scales which require mention are those of Fahrenheit, Réaumur, and Celsius. Of these, the first is commonly used in Britain, the second in Germany, and the third in France; but this last, under the name of the *centigrade* scale, is almost exclusively used

by scientific men of all nations. The relations of these scales will be easily understood by means of the following figure:

Fahr.	0	32	77	122	212

Réau.	0	20	40	80	

Cent.	0	25	50	100	

In the Fahrenheit scale, the freezing point is 32°, and the boiling-point 212°, so that the space between these is divided into 212 - 32, or 180, equal parts or degrees. In the others, the freezing-point is the zero, but the boiling-point is 80° and 100° respectively. It is of course perfectly easy to reduce from one of these scales to another. Thus—What is the centigrade reading for 77° Fahr. (See the dotted line in the figure)? The numbers in Fahrenheit's scale are all too great by 32, because 32°, and not 0°, stands for the freezing-point. Subtract this from 77, and we have 45. Hence the required number of centigrade degrees must bear the same ratio to the 100 from freezing to boiling in that scale that the 45 bears to the 180° between the same limits in Fahrenheit's. The requisite number is therefore

$\frac{45}{180} 100 = 25^\circ \text{C}$. In words—*To convert Fahrenheit to centigrade, subtract 32, and multiply by $\frac{100}{180}$, or $\frac{5}{9}$* . *Vice versá*—*To pass from centigrade to Fahrenheit, multiply, by $\frac{9}{5}$, and*

add 32. Thus the Fahrenheit value of 50 C. is $\frac{9}{5} 50 + 32 = 122$, as in the figure. Of course the similar processes with Réaumur's scale present no difficulty.

It is supposed that Fahrenheit fixed his zero at the point of greatest cold that he had observed, possibly in Iceland, more probably by means of a freezing mixture, such as snow and salt, or sal-ammoniac. It is much to be desired that the centigrade scale alone were employed.

A mercurial thermometer ceases to be of use for temperatures only a little above the freezing point of mercury; but it has a wide range upward, as mercury does not boil till about 600° C. On the other hand, a spirit-thermometer, though of little use beyond about 50° or 60° C., as alcohol boils at 70° C., is useful for any degree of cold yet produced, as alcohol has never yet been frozen. When extreme sensitiveness is required, ether being considerably more expansible than alcohol, is sometimes employed; as by Thomson in detecting the effect of pressure on the freezing-point of water. Water, again, would be about the very worst substance with which a thermometer could be filled; for not to speak of its expanding in the act of freezing, and therefore necessarily bursting the instrument, if it were ever allowed to reach the freezing-point, its scale would read partly backward and partly forward; for as ice-cold water is gradually heated up to 4° C., it contracts, and begins to expand again after that limit has been passed.

To make thermometers self-recording, various schemes have been proposed, of which we shall notice only one or two. Those most commonly used indicate only *maximum* and *minimum* temperature during each 24 hours; or during the interval which has elapsed since they were last set. The usual arrangement consists of two thermometers, a mercurial and a spirit one, fixed horizontally to the same frame, with their bulbs at opposite ends of the frame. Above the mercury is a small piece of steel or ivory, and in the spirit a small and light float of glass or enamel. Capillary forces prevent the steel from entering the mercury, and the enamel from leaving the spirit. As the mercury expands, it pushes the steel before it, and when it again contracts, it leaves it behind; the end nearest the mercury thus remaining at the highest or maximum indication which that thermometer has given. In the spirit-thermometer, the liquid, as it expands, freely passes the enamel, and leaves it undisturbed; but it can never contract so as to leave it dry. It therefore pulls the enamel back when it contracts, and thus the extremity furthest from the bulb marks the lowest point which the spirit has reached, or the minimum temperature. To set this instrument, incline it so that the steel falls back to the surface of the mercury;—the enamel at the same time comes to the surface of the spirit.

The best mode of registration is undoubtedly the photographic. For this purpose, a mercurial thermometer is placed vertically before a narrow slit, in such a way that no light can pass through the slit save above the level of the mercury in the tube. A gas flame is kept burning at some distance in front of the slit, the bulb of the thermometer being protected from its radiation; and behind the slit a sheet of prepared photographic paper is exposed to the narrow line of light which passes above the mercury. This paper is fixed on a cylinder with a vertical axis, which is made to revolve uniformly by clockwork. Lines are drawn by the clockwork on the paper, giving the position of the slit at each hour of the 24, or the gas flame is mechanically reduced or eclipsed at intervals of an hour; so that the record, when photographically developed, gives the tempera-

ture for every minute of the day and night; the portion of the paper which has been exposed to the light is blackened.

Among ordinary meteorological instruments the *wet-bulb* thermometer is deserving of notice. It is simply an ordinary thermometer, with the bulb covered with paper or cotton-wool, kept constantly moist by the capillary action of a few fibers connecting it with a small vessel of water. If the air be *saturated* with moisture (see DEW, EVAPORATION), there will be no evaporation, and the wet-bulb thermometer will give the same indication as the dry-bulb. But the drier and the warmer the air is the faster does the water evaporate, and (the latent heat of evaporation being mainly taken from the moist bulb) the lower does the mercury sink in the moist-bulb instrument. The difference between the readings of the two instruments, compared with the actual temperature, as shown by the dry-bulb, thus leads to a determination of the hygrometric state of the air.

So far, we have spoken of the instruments now in common use. But the *air-thermometer* was probably the oldest form; and possesses a scientific superiority over those just described. Theoretical and experimental investigations, connected with the modern dynamical theory of heat (see FORCE, HEAT), show that equal increments of heat produce almost exactly equal changes of bulk in a nearly perfect gas, such as air, if the pressure to which it is exposed be constant. Hence, temperature, as measured by an air-thermometer, gives a true indication of the quantity of energy present in the form of heat. As the comparison of an air-thermometer with a mercurial one shows that, for temperatures not greater than 300° C., or 572° Fahr., the indications of the two agree very closely, the ordinary mercurial thermometer practically possesses within these limits the same advantage.

As the pressure of a gas depends on the amount of heat it contains, the *absolute zero* of temperature, or the temperature of a body wholly deprived of heat, may be determined by finding the temperature at which a perfect gas would cease to exert pressure. For ordinary temperatures, it is found (see HEAT) that air increases in bulk by .3665, and hydrogen by .3658 of its bulk, when heated under constant pressure from 0° to 100° C. Again, by Boyle's law, if the air be compressed again, at constant temperature 100° C., to the bulk it had at 0° C., its pressure is increased by .3665 of its former amount. Thus, p_t being the pressure at temperature 0° C., p that at t° C., we have, when the volume is kept constant,

$$p_t = p_0 (1 + .003665t).$$

If we assume this to hold for all temperatures, p_t vanishes when

$$1 + .003665t = 0;$$

or $t^{\circ} = -274^{\circ}$ C. very nearly.

That is to say, at 274° C., under the freezing-point of water, a perfect gas ceases to exert pressure on its containing vessel—i.e., is deprived of that thermal energy on which pressure depends.

The air-thermometers in common use are affected by the pressure, as well as the temperature of the atmosphere. To avoid this inconvenience, Leslie and Rumford in the present century revived the *differential thermometer* of Sturmius. In this instrument, in one of its common forms, a bulb is blown at *each* end of the tube (which is bent into a U-form), and the liquid in the stem is used merely as an index, both balls being full of air. The length of the column of fluid is usually adjusted so that it can just fill one of the vertical arms and the horizontal portion of the tube; and the quantities of air in the two balls are so adjusted that the column will take this position *when the two balls are at the same temperature*. If the one ball be heated more than the other the liquid index will take a new position, and this is read off by a scale applied to either of the vertical arms. The graduation of this instrument may be effected by calculation, but it is usually done experimentally. Leslie made good use of it in his investigations on heat; and, with various adjuncts, such as coloring the glass of one ball while that of the other was left white; silvering or gilding one of the balls; covering one of them with moist silk or linen, etc., this instrument became in his hands a *photometer*, an *athrioscope*, a *hygrometer*, etc.

To thermometers which depend for their action on the expansion of solids, the name PYROMETER (q. v.) is frequently given; but that of Bréguet, as delicate as a good ordinary mercurial thermometer, is not alluded to in that article. The principle of this very beautiful instrument may easily be explained thus. In bending a slip of wood, the fibers on the convex side are necessarily more extended than those toward the concave side. Conversely, if the fibers on one side of a slip of wood were to expand more than those on the other, the slip would bend. Bréguet solders together two thin strips of gold and platinum, or platinum and silver; for portability and concentration bends the compound strip into a helix, fixes its upper end, and attaches a horizontal index to the lower end. The least change of temperature in the surrounding air changes the length of one side of the compound slip more than the other, and the helix twists or untwists through an angle very nearly proportional to the change of temperature.

For measuring radiant heat, the most delicate instrument is the thermo-multiplier. See THERMO-ELECTRICITY.

THERMOPYLÆ (literally, "the hot gates"), a famous pass leading from Thessaly into Locris, and the only road by which an invading army can penetrate from northern into southern Greece. It lies s. of the present course of the river Spercheus, between Mt. Ceta and what was anciently an impassable morass bordering on the Maliac gulf. In the pass are several hot springs, from which Thermopylæ probably received the first part of its name. Thermopylæ has won an eternal celebrity as the scene of the heroic death of Leonidas (q.v.) and his 300 Spartans in their attempt to stem the tide of Persian invasion (480 B.C.). Again, in 279 B.C., Brennus, at the head of a Gallic host, succeeded, through the same treachery that had secured a victory to Xerxes in forcing the united Greeks to withdraw from the pass.

THÉROIGNE DE MIRECOURT, 1762-1817, b. Luxemburg, France. Her true name was Anne Joséphe Terwagne. In 1789 she left the convent where she was receiving her education, went to Paris, and became a prostitute. She figured in the revolution as a leader of the virulent female mob. In 1791 she was seized by the allies in Holland and imprisoned in Vienna. On her return to Paris, 1793, her popularity was at first increased; but while trying to defend Brissot, her lover, she was seized, stripped, and whipped by a mob of maddened women. She became insane from this treatment, and the rest of her life was spent in *La Salpêtrière*.

THERSI TÊS, son of Agrius, whom Homer, in the *Iliad*, makes the ugliest and most impudent talker among the Greeks before Troy. His name in antiquity was a synonym for dastardy and malevolent impudence. The later poets say that he was slain by Achilles for calumniating him.

THESAU RUS. See **DICTIONARY**.

THE SEUS, one of the most celebrated personages of the Greek heroic age. The legend of his career is differently told, but he is usually said to have been the son of Ægeus, king of Athens, by Æthra, daughter of Pittheus, king of Troezen. He was brought up at the court of his maternal grandfather, and, on reaching manhood, proceeded to his father's residence at Athens. On his way thither he performed several famous exploits, such as the destruction of Periphetes, Sinis, Phæa, the Crommyonian sow, Skiron, Kerkyon, and the fell robber Procrustes. See **PROCRUSTES**. After his arrival Medea sought to poison him, but her plot failed. Ægeus recognized his son, and Medea and the sons of Pallas were banished. The next feats of Theseus were the capture of the Marathonian bull, and the deliverance of Athens from its dreadful tribute of youths and maidens to the Cretan Minotaur (q.v.), in which he was assisted by the Cretan princess, Ariadne (q.v.). On his return to Athens his father Ægeus destroyed himself, and Theseus succeeded to the throne. In his new capacity of ruler, he displayed no less wisdom than he had formerly shown heroism. To him the legend ascribes the consolidation of the 12 petty commonwealths of Attica into one state, an event that certainly did occur at some period of Attic history, which was commemorated by the festival of the *Synakia*. Theseus also reorganized the Athenaic festival, and re-named it the Pan-Athenaic, founded the Isthmian games, and many other institutions; but soon after the craving for his old stirring life returned, and having laid down his authority, he set out along with Heracles in quest of new adventures. They fought the Amazons, and Theseus carried off their queen, Antiope or Hippolyte, by whom he had a son. After the death of Antiope, he married Phædra. The legend makes him take part in the Argonautic expedition by a ludicrous anachronism, join in the Calydonian hunt, help Peirithous and the Lapithæ against the Centaurs, and assist in the attempt to rescue Persephone from the lower world (which led to a long imprisonment there, from which he was delivered by Heracles). Returning to Athens, he found that the minds of the people had been prejudiced against him during his absence, and as he could not re-establish his authority, he withdrew to Skyros, where he was treacherously destroyed by king Lycomedes. What grain of historical fact may lie in the myth of Theseus, it is hard to say. One of the most brilliant figures of the heroic age, reminding us, by his valor, wisdom, and generous love of the fair sex, of a knight of chivalry, we are loath to yield him up as a victim to the ravenous maw of criticism; yet all that can be said for his historic reality is, that so finished and admirable a prince is more likely to have been a legendary tradition of some real hero of primeval times, than a mere creature of poetic imagination.

THE SIS, a Greek term, strictly signifies a "placing" or "setting"—e.g., Pindar's *epôn thesis* (Ode iii. 14)—the "arrangement of words" in verse; but subsequently was employed by the philosophers (Aristotle, etc.), to denote an intellectual position that had to be maintained. This is the sense in which the word was understood by the scholastics of the middle ages.

THESMOPHORIA, a famous festival anciently celebrated in different parts of Greece, but especially in Attica, in honor of Demeter, as the *thesmophoros* or "law-giving" goddess, inasmuch as, by the introduction of agriculture, she gave the first impulse to civil society, and more especially to the honorable bond of marriage. The Thesmophoria lasted three days, from the 11th of the month Pyanepsion (October). Only married women could take part in the ceremonies. After certain preliminary purifications (among which abstinence from sexual intercourse was prominent), the women inaugurated

the solemnity by marching in procession from Athens to Eleusis, where the night was spent in celebrating the mysteries of the goddess. The next day, called *nesteia*, or the "day of fasting," was spent in mourning. The women sat for a while on the ground around the statue of Demeter, and ate nothing but cakes made of sesame and honey. They next proceeded barefooted to the Thesmophorion or temple of Demeter, where they deposited their mystical offerings to the goddess. On the third day, called *kalligenia* in honor of Demeter as the "mother of beautiful offspring," fasting was exchanged for merriment, jollity, and raillery.

THES'PIS. See DRAMA.

THESSALONIANS, FIRST EPISTLE TO THE, one of the earliest epistles of St. Paul—perhaps the very earliest—was probably written at Corinth about the close of the year 52 A.D., and seems to have been occasioned by the "good tidings" which Timothy brought him of the "faith and charity" displayed by his Macedonian converts. It may be divided into two portions, a *narrative*, and a *hortatory*; the former embracing the first three chapters, and terminating with a prayer for the Thessalonians, the latter the remaining two. From the narrative portion we derive much important and deeply interesting information regarding the "church of the Thessalonians;" but perhaps its great value consists in the picture it presents to us of the apostle himself—"bold in God," yet "gentle, even as a nurse cherisheth her children;" scornful to use "flattering words," or to "seek glory" from an assertion of his apostolic dignity; nay, in the excess of a noble pride, "laboring night and day because he would not be chargeable unto any." The epistle is conspicuous for the absence of the ordinary doctrinal element; even the word "justification," it has been remarked, does not once occur: on the other hand, it is penetrated with a deep conviction of the nearness of the second coming of Christ, and with an undefined fear lest, in spite of all his labors, the "tempter" (probably, in this case, the Hellenistic Jews of Thessalonica) should seduce the Thessalonian Christians from the "faith." Schrader (*Apostel Paulus*) was the first to impugn the genuineness of the epistle. He was followed in the same line by Baur; but their opinions have met with little favor among scholars of any party.—See Lünemann in Meyer's *Commentary*; Jowett's (2d ed. 1859) and Ellicott's (3d ed. 1866) *Commentaries*.

THESSALONIANS, SECOND EPISTLE TO THE, was likewise written at Corinth, and in all probability not long after the first. It is generally thought to have been occasioned by the misapprehension of the apostle's meaning on the subject of the coming of Christ to judgment, to which the previous letter had given rise, although Hug and others considered the expression "be not troubled. . . by letter, as from us" (chap. ii. 2), as indicating that somebody had forged an epistle in Paul's name; and it is scarcely possible to interpret the passage at the close of the letter, "the salutation of Paul with mine own hand, which is the token in every epistle: so I write" (chap. iii. 17), otherwise than as a precaution against forgery. From its contents we gather that adversaries of the apostle had been at work among his Macedonian converts, and that they had not scrupled to misrepresent his teaching, particularly on the great topic above mentioned. Who they were we cannot be sure, but it is probable that they were Jews or Judaizing Christians. They must have obtained a considerable measure of success in their nefarious enterprise, for we are distinctly aware of a sharper and more imperious tone in the language of Paul. He now teaches more precisely that Christ could not come until the antagonistic forces in human or diabolic society had made themselves more prominent, and done their worst. The genuineness of this epistle is as certain as that of the first. See the commentaries previously mentioned.

THESSALONIANS, EPISTLES TO THE (*ante*), were written not long after Paul had preached at Thessalonica the usual doctrines of the gospel, so that instead of stating them anew he simply referred to them as the gospel which he had taught; adding earnest practical exhortations for the government of heart and life. Yet the epistles contain doctrinal statements of great value with reference to the resurrection and the future coming of Christ; 1. These two events are placed together; 2. It is taught that they will occur before all the generations of men have died; 3. That the Christians then alive will have no advantage over the dead; since the latter will first arise, and come with the Lord; after which the living will be changed and caught up to meet him and them; 4. In the Second Epistle it is taught that the time when these events will occur is not revealed; but that before them a great apostacy from the faith must be witnessed, the description of which forms one of the most remarkable prophecies of Scripture.

THESSALONICA. See SALONICA.

THESSALY, the largest division of ancient Greece, lay to the s. of Macedonia and the e. of Epirus, being separated from the latter by mount Pindus, and from the former by the Cambunian mountains, the Ægean sea bounding it on the e., and the Maliac gulf and mount Ossa on the south. Thessaly proper is a vast plain shut in on every side by mountains; on the n. and w. by those already named, on the s. by mount Othrys, and on the e. by mounts Pelion and Ossa, the only opening being the Vale of Tempe in the n.e., between Ossa and Olympus. The plain of Thessaly is said at one time to have been a vast lake, the waters of which found an outlet by the Vale of Tempe. This plain is drained chiefly by the river Peneius (now *Salambria*), which traverses the country in a

n.e. direction, and its tributaries, and is the most fertile in all Greece, producing in ancient times abundance of corn and cattle, and a breed of horses considered the finest in Greece.

History.—Thessaly was originally called *Æolia*, indicating that the country was at one time inhabited by *Æolians*, who, however, were either expelled (proceeding s., and taking up their residence in *Bœotia*, etc.) or reduced to slavery by immigrants from the more rugged region of *Epirus*, about 1000 B.C. As in *Laconia*, the inhabitants of Thessaly appear to have been divided into three classes—1. There were the *Epirote* conquerors, who became rich landed proprietors; 2. Those descendants of the original inhabitants, who, although dependent on the nobles, yet possessed a few privileges—corresponding to the *Laconian pericæci*; and 3. The *Penestæ*, or those of the original inhabitants who had been reduced to serfdom, and who cultivated the lands of their conquerors, corresponding to the *helots*, although, on the whole, their condition was better. These latter frequently rebelled against their masters, who were very frequently at war among themselves. Each of the four districts into which Thessaly proper was divided was regulated by a council of its own, but they were occasionally united under a tagus or president, whose power and time of office appear to have been indefinite. The government, from an early time, appears to have been oligarchal in the separate cities—of which *Pharsalus*, *Larissa*, *Heracleum*, and *Phere* were the chief—the principal power being in the hands of the two great families of the *Alenads* and *Scopads*, famous for their hospitality and encouragement of poets and artists. Thessaly, however, never played any important part in Grecian history, and it was only after the end of the *Peloponnesian* war that it exercised any influence on the affairs of Greece. About that time (490 B.C.), *Lycophron*, overthrowing the government of the nobles, became tyrant of *Phere*, and endeavored to make himself master of all Thessaly. What he failed to accomplish, his successor, *Jason*, succeeded in doing, causing himself to be elected tagus of all Thessaly about 374 B.C.; his assassination in 370 B.C. preventing him from attempting to become master of all Greece as he intended. The rule of *Jason's* successors became so unbearable, that, in 353 B.C., the old families called in the aid of *Philip* of *Macedon*, who compelled the "tagus" to abdicate, and in 344 subjected the country to *Macedonia*. Thessaly remained subject to the *Macedonian* kings till the victory by *T. Flaminius* at *Cynoscephalæ*, in 197 B.C., restored it to the protection of *Rome*. Under the emperors, Thessaly was united with *Macedonia*, but after *Constantine* it was a separate province. In 1204 A.D., with other portions of the eastern empire it came under the dominion of the *Venetians*, and in 1355 was taken by the *Turks*. The restoration to Greece of Thessaly s. of the *Salambría* was recommended by the *Berlin congress* in 1878.

THETFORD, a municipal and parliamentary borough and market-t. of *Norfolk*, on the *Little Ouse*, 95 m. n.e. of *London* by the *Great Eastern*. Malting is carried on to a considerable extent, and there is some trade on the *Ouse*, which is navigable up to this point. There are remains of a *Cluniac* priory, and of other religious edifices. Pop. '71, 4,166. The borough was disfranchised by the reform bill of 1867.

At *Thetford*, which is a very ancient town, a synod was held in 669; and two centuries later, in 870, it was taken and sacked by the *Danes*.

THE'TIS, daughter of *Nereus* and *Doris*, was married against her will by the gods to *Peleus*, by whom she became the mother of *Achilles*. She dwelt in the depths of the sea with her father, and had, like *Proteus*, the power of changing her shape. Her hand is said to have been sought by *Poseidon* and *Zeus*, who gave up the pursuit on *Themis* declaring that the son of *Thetis* would be greater than his father.

THIAN-SHAN, or **CELESTIAL MOUNTAINS**, a great mountain system, consisting of several ridges, mostly parallel, in central Asia, are situated to the s. and e. of lake *Issyk-kul*, in lat. about 42° north. They are said to extend in an e.n.e. direction from the vicinity of *Samarkand*, to long. about 96° e.—a distance of 1500 miles. As this range, however, was never visited by any European till *P. Semenov*, commissioned by the imperial Russian geographical society, explored a part of it in 1858, little has been actually ascertained regarding its character and dimensions. It is one of the four great ranges, trending in a general direction from w. to e., which traverse central Asia—and these respectively are the *Altai-Sayan*, or *Altai* mountains, in lat. about 50° n.; the *Thian-shan* mountains, lat. about 42° n.; the *Kuen-lun* system, lat. about 36° n.; and the *Himalaya* mountains (q.v.). In long. 76° to 79° e., the *Thian-shan* mountains are divided into two great, nearly parallel ridges, and inclose between them a deep valley, about 15 m. in average breadth, through which the river *Narin*—the chief head-water of the *Sir-daria*—flows in a w.s.w. direction. East of these ranges, the mountains are known as the *Tengri-Tagh*; and of this subdivision the chief peak is the *Tengri-Khan* (i.e., specter-prince), in lat. 42° 23' n., long. 79° 40' e., and which rises to the height of 21,000 feet. East from the *Tengri-tagh*, the *Thian-shan* mountains continue in a double chain, and at an average height of 11,330 feet. In long. 90° e. is the volcano *Pe-shan*, which is believed to have been in activity prior to the 7th c.; and in the vicinity are several other volcanoes. These are remarkable as the only instances of volcanic fires at so great a distance—1500 miles—from the sea. In long. 88° e. is the huge mountain-mass of *Bogdo-oola*, perhaps the culminating point of the whole system, and certainly

the peak on which there is the greatest accumulation of snow. There are several passes of from 10,000 to 13,000 ft. in height.

THIBAUT, or **THEOBALD I.**, King of Navarre, and Count of Champagne, 1201-53; b. France; brought up at the court of Philip Augustus. He was in love with Blanche of Castile, queen of Louis VIII., though 14 years her junior, and when Louis died, in 1226, it was suspected that he had been poisoned by Thibault. The latter at first allied himself with the league of nobles against Blanche, regent during the minority of her son, but was soon won over by her. On the death of his grandfather, Sancho the wise of Navarre, in 1234, he inherited that kingdom. He went to Palestine in 1239, but was badly defeated at Gaza. He afterward took part in the persecution of the Albigenes. He was a friend of literature, and was a *trouvère* of no mean order.

THIBET, **TIB'ET** or **TUBET**, is the European name of a country in central Asia, bounded on the n. by Mongolia, on the e. by China, and on the s. and w. by Hindustan. The native name is *Bod* or *Bodyul*, the land of *Bod*. It covers an area of from 600,000 to 800,000 sq m., with the north-eastern part of which we are still almost totally unacquainted. The pop. is estimated at 6,000,000.

Surface.—From an elevated tract at the western extremity of Thibet, where the Hindu-Kush and Pamir highlands meet, the mountain-system of the Kuenlun runs e., and the greater chain of the Himalaya s.e., inclosing in the angle between them the Thibetan table-land, which extends eastward to the frontier of China. Although Thibet is described as a table-land by geographers, its surface is traversed by mountain-chains, which, near its western and eastern frontiers, interlace and ramify in a complicated manner. On the southern border the height of the plateau through which the Sanpu runs, from a point near its source to H'assa, was in 1866 carefully ascertained by barometrical observation. Along the great route from H'assa to Gartok, in the basin of the Indus, for a distance of 800 m., the average elevation was found to be 13,500 feet. Several stages of the journey along the route were above 16,000 ft.; only one sank to 11,000. To the n. and e. of this elevated tract, the plains of Thibet are supposed to descend to much lower elevations; but accurate observations are still wanting. The Himalaya, 20 summits of which are higher than the loftiest of the Andes, stand out from the plateau, and are only connected with it by ridges of lesser elevation. They project from the highlands like buttresses which rise higher than the walls they support. In general the descent from Thibet on the s. is by three gradations, the first of which is very abrupt. The mountain-roads by which Thibet is entered from India, pass through deep ravines cut by the streams in the mountains, and present the wildest and grandest scenes described by travelers.

The mountains which rise from the table-land divide Thibet into several natural regions. The Karakorum range, which runs parallel to the Himalaya, forms with them a great valley, drained on the w. by the tributaries of the Indus, and on the e. by the Sanpu. To the whole basin of the Indus n. of the Himalaya, the name of little Thibet is sometimes given; but more generally the upper basin is known as Ngari, the middle basin as Ladak (q. v.), or middle Thibet; and the lower as Baltistan, or lower Thibet. The countries drained by the Sanpu are described as Thibet proper, which is in turn divided into Dsang, the district of the upper Sanpu, and Wei, surrounding H'assa, the district of the lower Sanpu. Further e. the tract drained by the tributaries of the Yang-tze-kiang, in which are Lithang and Bathang, is known as Kham. North of the basin of the Sanpu lies another region, a great elevated desert, called Khor on the w., and Katchi on the e.; and at the north-eastern extremity of Thibet is a hilly tract, in which the Hoang-ho takes its rise, and in the center of which is situated the lake Ko-ko-nor. The provisional name given to the tract is the country of the Ko-ko-nor.

Geology.—The geology of Thibet is little known except on the s. and western frontier. The highest part of the Himalaya consists of granites and crystalline strata, and in the neighborhood of the lake Manasarowar, of volcanic rocks. On the table-land, the strata belong to the most recent tertiary epoch (the Pleistocene). They lie horizontally as they were deposited, and seem to have been lifted up in one unbroken cake to their present prodigious elevation. Thibet is believed to abound with silver, copper, and tin, but the absence of fuel renders its mineral wealth unavailable. Gold is found in considerable quantities; and salt, sulphur, borax, and niter abound.

Climate.—Thibet lies between the latitude of Naples and Cai. o. and might be supposed to enjoy a similar climate. But its great elevation renders it excessively cold during the winter, when its climate resembles that of the arctic regions more than that of countries in the zone to which it belongs. The mountains and the great plains which lie between Thibet and the sea rob the winds of their moisture, and hence another peculiarity of the climate is its excessive dryness. Timber never rots, but it breaks from brittleness; flesh exposed to the wind does not become putrid, but dries, and can be reduced to a powder. The air loses its conducting power; and persons dressed in sheepskins give out long electric sparks when they approach conducting substances. During the winter, the winds are excessively high, and the weather-beaten rocks break into a dust, which mixes with the loose alluvial soil, and with it is blown about in blinding clouds. The limit of perpetual snow is from 16,000 to 18,000 feet high on the Thibetan side of the Himalaya, while on the Indian or southern side it is in some places only 13,000—a fact attributed

to the dryness and purity of the air above the table-land. The Tibetan glaciers, particularly in the mountain region of the w., are of enormous extent. Pastures and low bushes make their appearance at 18,544 ft.—2,800 ft. higher than Mont Blanc, and 1279 ft. above the snow-line on the Andes near Quito. Below this level extends a country of bare and scanty pastures. Owing to the great dryness of the air, trees (the cedar and birch) are only met with in a few scattered spots on the hills. In the great plains, the pursuits of the inhabitants are chiefly those of the pastoral tribes of the steppes of Central Asia. In the valleys, however, the soil is more productive; and fruit-trees, the vine, and the European grains are cultivated. The conditions of the climate render irrigation necessary, and the construction and maintenance of terraces along the slopes. This has given rise to a kind of agriculture characteristic of Thibet, which demands skill and continuous labor, and which has called into existence an intelligent, strong, and hardy population. Among the productions of Thibet are barley, buckwheat, grapes, and all the European fruits.

Industry.—The Thibetans have made considerable progress in the industrial arts. They are ingenious jewelers, and manufacture extensively fabrics of wool and goat's hair, Buddhist idols, etc. In spite of the inaccessible nature of the country, and the absence of good roads and bridges, the rivers being crossed by inflated skins, a great trade is carried on with the neighboring lowlands. That with China is conducted chiefly at Sining, but partly at H'lassa, by caravans, the goods being conveyed on the backs of oxen, mules, and horses. The raw produce of Thibet is exchanged for tea, or Chinese manufactures, and European cutlery. A great trade is also carried on with Nepaul and Bhotan, from which, in exchange for the produce of Thibet, broadcloths and Indian manufactures are imported. From Turkestan the trade is no less important.

Language and Religion.—The language of the Thibetans, spoken also in Nepaul, and by the inhabitants of Bhotan, belongs to the monosyllabic or Chinese class. See PHONOLOGY. Thibetan is singularly free from dialects, from which it is concluded it spread rapidly in recent times. It has a copious literature, chiefly religious. The religion of the Thibetans is a kind of Buddhism. See LAMAISM. At the extreme w. in Bulistan, however, Mohammedanism prevails, which, having spread from Cashmere and Persia, and not from Turkestan, is Shiite. Some practices common, it is believed, to the earlier races of men, are said to survive among the Thibetans. The most remarkable is polyandry (q.v.), brothers being allowed to have one wife in common.

Government.—Almost the whole of Thibet proper is now tributary to China. The government is to some extent, however, in the hands of a Buddhist hierarchy, the name of the chief priest being the Dalai-lama, and the second the Bogdo-lama. These spiritual and temporal princes rule in different parts of the country. There are Chinese soldiers in all the chief towns, and a few years ago their number was said to be upward of 60,000. The Chinese generals have the entire control of the army, and the direction of the most important temporal affairs. Commerce is in the hands of the government, and is closely watched, there being Chinese garrisons at the entrance to all the chief passes.

There are several important towns in Thibet, of which H'lassa (q.v.) is the chief.

History.—The early history of Thibet is legendary. The first king, who flourished 113 B.C., was exposed in a copper box, and afterward found swimming in the Ganges. As early as the beginning of the 5th c. after Christ, a Buddhist missionary from Cashmere is said to have penetrated into Thibet, and to have obtained a footing for the doctrines of Buddha. In 821, Thibet was compelled to pay tribute to China. Early in the 10th c., king Dharma adopted Mohammedanism; but he was killed in 925, and Buddhism was re-established. In the beginning of the 11th c., Thibet was split into several states, and its power declined. In the 12th and 13th centuries, the Chinese began to conquer the eastern parts of Thibet, which, however, did not become tributary to Peking till 1720, when they were placed under their present government. Western Thibet has been more exposed to the inroads of the Turkish tribes than of the Chinese. The former were, however, expelled from it by Aurungzebe in the 17th c., and then it was that Mohammedanism was introduced. In the early part of this century, western Thibet was annexed to the Sikh empire of Runjeet Singh. It now forms part of the territory of the Maharajah of Cashmere.

Until a comparatively recent period, Thibet was only known from the accounts given by Marco Polo and the Jesuit missionaries, travelers respectively of the 13th and 17th centuries. It was, however, visited in 1774 by George Bogle, and in 1783 by Samuel Turner, both sent by Warren Hastings on missions to the Dalai-lama. In this century it has been partially explored by Manning (1812), capt. Strachey (1846), the French Jesuits Hue and Gabet, the brothers Schlagintweit (1855-56). On May 15, 1866, it was stated to the geographical society of London that a regular survey of lower Thibet and Ladak had been completed by the Indian government. While the work was proceeding, maj. Montgomerie, the officer in charge, conceived a plan of carrying out the survey in the neighboring districts of Thibet, elosed by the jealousy of the Chinese officials against Europeans. He had Hindus of education, or pundits, instructed specially to take scientific observations, and sent them, disguised as merchants, to explore Thibet beyond the Chinese frontier. The pundits traveled over and carefully surveyed that part of the country lying n. of the Himalaya, and between the frontier of Cashmere

and H'lassa. They visited the great gold-fields of Thibet, which were found to extend 1000 m. s.e. of Ileh, the mart from which the produce of the diggings is exported; and they furnished accurate and copious information about districts which, as yet, no European has been allowed to enter. One of these pundits, a semi-Thibetan, who was dispatched in 1871 succeeded in exploring 320 m. of unknown territory, discovering and marching round the great lake Tengri-nor in the n., which is 50 m. long. The journey of the pundit Nana Singh, in 1874 and 1875, is one of the most important in geographical results that have been made in the present century. Passing from Leh to H'lassa, he traversed for the first time the vast lacustrine plateau of Thibet, and thence made his way into Assam. While these explorations have been made in the west of Thibet, attempts have been made to penetrate the south-eastern corner of the table-land.—See col. Montgomerie's *Reports of Trans-Himalayan Explorations; Tibet in the Last Century*, by Clements Markham (1876); and articles in the *Geographical Magazine* for 1875, 1876, and 1877.

THICK-KNEE, *Oedinemus*, a genus of birds of the family *charadriade*, most nearly allied to the plovers, although, from their comparatively large size, they have often been ranked with bustards. They differ from the true plovers in having both mandibles inflated toward the tip, and not merely the upper mandible. There are about half a dozen species. Only one occurs in Britain, the COMMON THICK-KNEE (*O. creptans*), also known as the thick-kneed plover, thick-kneed bustard, great plover, Norfolk plover, and stone curlew.

THIELT, a t. of Belgium, in the province of w. Flanders, 16 m. s.s.e. of Bruges. It is a well-built town, containing several interesting edifices and institutions. An important linen market takes place here annually, and the principal manufactures are linen, woolen and cotton goods, gloves, vinegar, beer, and tobacco. Pop. '76, 10,209.

THIERRY, JACQUES NICHOLAS AUGUSTIN, an eminent French historian, was born at Blois, May 10, 1795. He received his education in the normal school of his native town, and became a teacher in a provincial school. In 1814 he resigned this charge, came to Paris, and published his first work, entitled *De la Réorganisation de la Société Européenne*. In this treatise he considers the practicability of having one government for the whole of Europe, preserving at the same time the nationality of each people. Adopting the views of St. Simon, Thierry became the assistant of that philosopher, in which capacity he worked for three years. In 1817 he joined Comte and Dunoyer as editors of the *Censeur Européen*, in which he wrote many articles, literary, political, and historical. In 1820 he became engaged on the *Courrier Français*, in which he published his *Dix Lettres sur l'Histoire de France*. He now began to addict himself almost exclusively to historical writing. Having given up the *Courrier*, he published his masterpiece, *L'Histoire de la Conquête d'Angleterre par les Normands* in 1825, and his *Lettres sur l'Histoire* (1827), works which had great success; but his success was dearly bought, as the necessary labor seems to have ruined the eyesight of the author. Becoming quite blind in 1830, he went in that year in to Hyères for the benefit of his health. Here he met Julie de Quérangal, an authoress of considerable repute, whom he married in the following year. He seems to have been able partially to resume work about this time, and in 1835 he published his *Dix ans d'Etudes Historiques*, the introduction to which is one of the most eloquent of his works. In 1840 appeared his *Récits des Temps Mérovingiens*, which work gained the great Gobert prize. The preface gives an interesting and eloquent account of the history of his own literary labors. His last publication was the *Essai sur l'Histoire de la Formation et de Progrès du Tiers Etat*, in 1853. The author died May 22, 1856 his wife having predeceased him in 1844. During his life Thierry enjoyed the success and popularity due to his industry and talents. His careful research has thrown much light on the early ages of which he has written, and dispelled much popular error regarding them. He is second to no French historian of the present day.

THIERS, a manufacturing t. in France, in the dep. of Puy-de-Dôme. It stands in a pleasant valley on the right bank of the Durole, 23 m. e.n.e. of Clermont. Its manufactures of cutlery, paper, and playing-cards gave to the town a certain importance in the 17th century. Pop. '76, 11,182.

THIERS, LOUIS ADOLPHE, French historian and statesman, was b. April 16, 1797, at Marseilles. His father is variously reported to have been a locksmith, a decayed cloth-merchant, or an advocate at the parliament of Marseilles; his mother belonged to an old commercial family which had fallen into poverty. He was placed by his mother's relatives in the lyceum, where he achieved many victories over his young competitors. In 1815 he was sent to Aix to pursue the study of the law. Here he formed his friendship with M. Mignet the historian, in company with whom, as soon as he had taken his degree as advocate, he set off to Paris to seek his fortune. He lived for a time in obscurity and indigence, but, obtaining an introduction to Lafitte, he was enrolled among the contributors to the *Constitutionnel*, then the leading liberal organ. He became distinguished for the vigor and hardihood of his articles, and as in France the occupation of a journalist was at that time and for many years afterward regarded with an estimation proportioned to its influence over society, the young political writer was admitted into the most brilliant circles of the opposition. In the crowded saloons of Lafitte, Casimir Perier, the comte de Flahault, the baron Louis (the great financier of the

cra), and of M. de Talleyrand, he enjoyed an intercourse with actors in the grand revolutionary drama, which was eminently useful to him in the great undertaking which he had long meditated. *L'Histoire de la Révolution Française* at once placed the briefless advocate and young political writer in the highest ranks of literary celebrity. Three editions were soon called for, and the profits upon the sale, and the gift of a share in the *Constitutionnel*, conferred upon him by an admirer, raised him to comparative affluence. Leaving his garret in the alley of Montesquieu he emerged into fame, and became one of the most prominent men of France in the two paramount fields of literature and politics. In Jan., 1830, he established a new paper of more democratic principles, the *National*. Assisted by Armand Carrel and some of the ablest men of the liberal party, Thiers in this journal waged unrelenting war against the Polignac administration, which at length, stung beyond endurance, took the desperate measure of issuing the ordinances of July. The revolution of 1830 was the result. Thiers now devoted himself to a public career, and was appointed secretary-general to the minister of finance and elected deputy for the town of Aix. His first appearance in the chamber of deputies gave no promise of his subsequent distinction. His diminutive person, his small face, encumbered with a pair of huge spectacles, and his whole exterior presenting something of the ludicrous, the new deputy, full of the impassioned eloquence of the revolutionary orators, attempted to impart the thrilling emotions recorded of Mirabeau. The attempt provoked derision, but soon subsiding into the oratory natural to him—simple, easy, vigorous, rapid, anecdotic—he became one of the most formidable of parliamentary champions. From 1832, when the Soult cabinet was constructed, he continued a minister, with one short interval, until 1836. He was by turns minister of the interior, minister of commerce and public works, and minister for foreign affairs under various chiefs—Soult, Gérard, Mortier, and Broglie. In Feb., 1836, he was nominated president of the council and foreign minister by Louis Philippe. He only held this office until Aug., 1836, when he passed into opposition. In 1840 he was again called by the king to the premiership. He refused lord Palmerston's invitation to enter into an alliance with England, Austria, and Prussia for the preservation of the integrity of the Ottoman empire, from some lingering sympathy with the principles which dictated the first Napoleon's invasion of Egypt and Syria, and a desire to accomplish by diplomatic relations with Mehemet Ali that which Bonaparte had sought to effect by force of arms—a controlling power on the part of France in Syrian and Egyptian affairs. Lord Palmerston entered into the treaty without France, Acre was taken by the English fleet, and Mehemet Ali was driven out of Syria. The popular irritation in France fostered by Thiers was excessive, and nothing but the peaceful character of Louis Philippe prevented the French nation from rushing into a war of defiance to all the powers of Europe. Thiers alarmed the continent by his threats of setting aside the treaties of 1815 and extending the French frontier to the Rhine. It was computed that he spent not less than £8,000,000 in military and naval demonstrations. The effect of the ill blood thus generated was felt shortly afterward in the seizure of the Society islands, and in the remonstrances which the British government saw reason to address to that of France respecting the ill treatment of Mr. Pritchard, their consul at Tahiti. Louis Philippe dismissed his bellicose prime minister, and Europe again tasted the sweets of repose. He employed his leisure in historical pursuits. His *Histoire du Consulat et de l'Empire*, begun in 1845 and completed in 1860, is one of the greatest historical works of the age. At the revolution of 1848 he accepted the republic, but was banished after the *coup d'état* of 1851 (see LOUIS NAPOLEON). After a short residence in Switzerland he was permitted to return to Paris, where he published a continuation of his *History*. He re-entered the chamber in 1863, having been elected deputy for the department of the Seine by the liberal opposition. In his speeches Thiers constantly taunted the empire with the loss of foreign *prestige*; and these taunts are not to be left out of record when the disastrous war of 1870 is to be rightly accounted for. When that conflict became inevitable, he predicted the certain defeat to France it would lead to. The early disasters of the war brought him into a particularly prominent position. It was Thiers who suggested the laying waste of the country around Paris. He declined to become a member of the government of national defense, formed on the downfall of the empire; but voluntarily undertook diplomatic journeys to England, Russia, Austria, and Italy, on behalf of France—a self-imposed mission in which he was unsuccessful, but by which he acquired the unfeigned gratitude of his countrymen. According to the suggestions of these four neutral powers, Thiers opened negotiations for peace with the king of Prussia at Versailles, which, however, were for the time unavailing. After the capitulation of Paris Thiers was elected to the national assembly by the vote of a third of the French nation, and was chosen by the assembly to be head of the provisional government. Owing to his good sense the French accepted the terms of peace offered by Prussia. In 1871, after having crushed the commune and restored order, he ceased to be “chief of the executive power” of France to become “president of the French republic;” and this office he held till May, 1873, when, failing in his effort to make the republic permanent by definitive legislation, he made way for marshal MacMahon. His death (Sept. 5, 1877) was a severe blow to the republicans of France, whose leaders had latterly come to regard Thiers, though a “conservative republican,” as head of the whole republican party. Thiers had been a member of the *Académie Française* since 1836.

THIONVILLE, a fortified t. of Alsace, in the German province of Alsace-Lorraine, on the Moselle river, 19 m. n. of Metz, situated on a broad plain; pop. '70, about 8,000. It is fortified by a wall built under the old school system, which ranked it as a 3d class fortress. After the French were defeated at Forbach, and retreated to Metz, this fortress greatly troubled the Prussians then laying siege to Metz. Three unsuccessful attempts to take Thionville were made by the Prussians in August, September, and October. After the fall of Metz a greater force could be spared, and the place was bombarded from early morning of Nov. 22d to the evening of the 24th, 1870, by 85 guns, when it surrendered. The fortifications were little injured by the attack, although many buildings in the place were demolished.

THIRD, the name popularly given to a musical interval, or rather to two different musical intervals, which are distinguished as the *major* and *minor* third. The major third is the interval between a note and its mediant, as between C and E; its ratio is 4 to 5, and it comprises four semitones. The minor third has for ratio 5 to 6, as from A to C, and comprises but three semitones.

THIRDS, in Scotch law, means the share which a widow, on surviving her husband, has in his personal property. During the marriage, his personal property, as well as her own, form one common fund, called the goods in communion; and on the death of either, there is a division between the survivor and the children or next of kin. If there are children, they take two-thirds, and the widow takes the remaining third. But if there are no children, or descendants of children, she takes one-half.

THIRLAGE is, in the law of Scotland, a peculiar right or servitude enjoyed by the proprietor of a mill over the neighboring lands, whereby the owner or possessor of such lands is bound to carry the corn grown thereon to be ground at his mill. The miller or owner of the mill is entitled to certain duties from the suckeners, i.e., the possessors of the lands within the thirl or sucken, and these duties are called multure, being a proportion of the grain or flour. Such multure are called insucken multure; while out-sucken multure are similar payments made by strangers, who are not bound to send their corn to the mill, but choose to do so. Many nice questions have been raised between proprietors on this subject; but these are technicalities which must sooner or later be abolished, and the whole system is unsuited to the present times. Thirlage is extinguished by the ruin of the mill or by forty years' exemption. In England there is no similar right, except in some ancient manors, where an immemorial custom to a like effect exists.

THIRLWALL, CONNOP, D.D., 1797-1875; b. England; educated at Cambridge; became a fellow and tutor; admitted to the bar at Lincoln's Inn. 1825; relinquishing law, was ordained, 1828; rector of Kirby-under-Dale, Yorkshire; made bishop of St. David's, 1840. He published, with Charles Hare, a translation of the first two volumes of Niebuhr's *History of Rome*; and in 1835 wrote for Lardner's *Cabinet Cyclopaedia* the first vol. of *History of Greece*, completed in 8 vols. He was for several years examiner of the university of London, visitor of St. David's college, Lampeter, and an associate editor of the Cambridge *Philological Museum*. He published sermons, charges, letters, and addresses, entitled *Literary and Theological Remains*.

THIRSK, a parliamentary borough in the n. riding of Yorkshire, on both banks of the Codbeck, an affluent of the Swale, 23 m. n.w. of York. It contains an old, large and handsome Gothic church, and carries on manufactures of leather and saddlery. Pop. '71, of borough, which returns a member to parliament, 5,734.

THIRST is a well-known sensation, resulting from a peculiar state of the mucous membrane of the digestive canal, but especially of the mucous membrane and the fauces, usually caused by an insufficient supply of liquid. In cases of extreme thirst, there is a peculiar sense of clamminess in the mouth and pharynx; which, with the other disagreeable feelings, is almost immediately relieved by the introduction of liquid into the stomach, where it is absorbed by the veins. That the thirst is relieved by the absorption of the fluid, and not by its action as it passes over the mucous membrane, which seems to suffer most, is proved by the facts—(1) that injection of liquids into the stomach through a tube (in cases of wounded œsophagus), and (2) the injection of thin fluids, as water, into the blood, remove the sensation of thirst. An excessive thirst is often an important morbid symptom. It may arise from two very opposite conditions—one a condition of excitement, and the other of depression. Whenever the blood is in a state requiring dilution, and is too stimulating, as in fevers and inflammation, there is thirst; and, again, in cases of excessive secretion and exhaustion; as for example in cholera and in the two forms of diabetes, there is great thirst, which sometimes also attends the lowest stages of prostration in malignant diseases. When there is a great loss of the watery portion of the blood by profuse perspiration, caused not by disease, but by hard bodily exercise in a hot atmosphere, as in the case of coal-whippers, mowers, and reapers, etc., there is always great thirst, and from two to four gallons of beer or cider a day may, in these cases, be taken with impunity, if not with advantage. Cold tea, without milk or sugar, is the most satisfying drink under these circumstances. Independently of disease, great thirst may be induced by the use of salted meat or fish, highly-peppered curries, and other stimulating dishes, the ingestion of malt liquors

drugged with salt and more pernicious matters, or of gin strengthened by sulphuric acid, etc. In all these cases the symptoms point to the natural remedy.

THIRTY TYRANTS, at Athens, were a body of rulers invested with sovereign power after the close of the Peloponnesian war. They were all native Athenians, but members of the aristocratic party, and chosen by the Spartan conquerors, who, knowing the animosity existing between the democracy and oligarchy of Athens, hoped to rule the city through the agency of the latter. Their government was a positive "reign of terror," marked by the most infamous cruelties. Even Mitford, with all his hatred of democracy, speaks of the "shamelessness of crime" as surpassing all that had previously occurred in Grecian history. It lasted only one year, when it was overthrown by the return of the Athenian exiles under Thrasybulus.

THIRTY TYRANTS of the Roman Empire, is the collective title given to a set of military usurpers who sprung up in different parts of the empire during the 15 years (253-68 A. D.) occupied by the reigns of Valerian and Gallienus, and amid the wretched confusions of the time, endeavored to establish themselves as independent princes. The name is borrowed from the Thirty Tyrants at Athens, but, in reality, historians can only reckon nineteen—Cyrriades, Macrianus, Balista, Odenathus, and Zenobia, *in the east*; Postumus, Loliianus, Victorinus and his mother Victoria, Marius, and Tetricus, *in the west*; Ingenius, Regilianus, and Aureolus, in Illyricum and the countries about the Danube; Saturninus, in Pontus; Trebellianus, in Isauria; Piso, in Thessaly; Valens, in Achaia; Æmilianus, in Egypt; and Celsus, in Africa.—See Niebuhr's *Lectures on Roman History*, and Gibbon's *Decline and Fall of the Roman Empire*.

THIRTY YEARS' WAR was not properly one war, but rather an uninterrupted succession of wars (1618-48) in Germany, in which Austria, the most of the Catholic princes of Germany, and Spain, were engaged on one side throughout, but against different antagonists. This long-continued strife had its origin in the quarrels between the Catholics and Protestants of Germany, and the attempts of the former, who were the more powerful body, to deprive the latter of what liberty of worship they had obtained. The severe measures taken by the emperor, the head of the Catholic party, against the Protestant religion, led also to strictures on their civil rights; and it was to protect their political as well as their religious liberties that the Protestants formed a union, May 4, 1608, with Frederick IV., the elector palatine, at its head. The rival union of the Catholic powers, under the leadership of the duke of Bavaria, followed July 11, 1609. In Bohemia, the immense preponderance in numbers (two out of three) and influence of the Protestants had forced from their Austrian king an edict of toleration (July 11, 1609), which was at first faithfully observed; but during the reign of Matthias, sundry violations of it were made with impunity; and as the influence of Ferdinand of Styria (see FERDINAND II.), his successor, began to be felt in more flagrant partiality to the Catholics, the kingdom became a scene of wild excitement; three of the Catholic party were thrown from the window of the Bohemian council-chamber at Prague, and ultimately Ferdinand was deposed, and Frederick V., the elector palatine, chosen in his stead (1619); and count Thurn, at the head of an insurgent army, repeatedly routed the imperial troops, and actually besieged the emperor in Vienna. The Catholic princes, though as apprehensive as their opponents of the encroaching policy of Austria, crowded to the emperor's aid; and while the Protestant union and James I. of Great Britain held aloof from Frederick, whose sole allies were Bohemians (under Thurn), Moravians, Hungarians, and a Piedmontese contingent of 3,000 (under count Mansfeld), a well-appointed army of 30,000, under duke Maximilian, advanced to support the Austrians, and totally routed Frederick's motley array at Weissenberg (Nov. 8, 1620), near Prague, afterward reducing the upper, while an army of Spaniards under Spinola ravaged the lower palatinate, and the Saxons (in alliance with the emperor), occupied Lusatia. The Bohemians were now subjected to the most frightful tyranny and persecution; a similar policy, though of a more moderate character, was adopted toward the people of the palatinate—the Protestant union standing aloof, and subsequently dissolving, through sheer terror. But the indomitable pertinacity and excellent leadership of count Mansfeld and Christian of Brunswick, two famous partisan leaders, who ravaged the territories of the Catholic league, and the forced cession to Bethlem Gabor of large portions of Hungary and Transylvania, did much to equalize the success of the antagonistic parties.

Here the war might have ended; but the fearful tyranny of Ferdinand over all the Protestants in his dominions (Hungary excepted), drove them to despair, and the war advanced to its second phase. Christian IV. of Denmark, smarting under some injuries inflicted on him by the emperor, and aided by a British subsidy, came to the aid of his German co-religionists in 1624, and being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony, while the emperor, hampered by the political jealousy of the Catholic league, was unable to oppose him. But when, by the aid of Wallenstein (q. v.), a powerful and effective army had been obtained, and the leaguers under Tilly, in co-operation with it, had marched northward, the rout of the Danes by Tilly at Lutter (Aug. 17, 1626), and of Mansfeld by Wallenstein at Dessau (April 1, 11, and 25, 1626), again prostrated the Protestants' hopes in the dust; yet a gleam of comfort was obtained from the victorious raid of Mansfeld through Silesia, Moravia, and

Hungary, though his scheme for an insurrection in Hungary failed, and his death soon after, at Zara, freed the emperor from a formidable and irreconcilable enemy. The combined imperialists and leaguers meantime had overrun North Germany and continental Denmark, and ultimately compelled king Christian to conclude the humiliating peace of Lübeck (May 12, 1629). This second great success seems to have turned Ferdinand's head, for not content with a still more rigorous treatment of the Protestants, and the promulgation of the *restitution edict*, which seriously offended even the Catholics, he stirred up Poland against Sweden, and insulted Gustavus Adolphus, both personally and in the persons of his ambassadors—insolent impertinences which he soon saw bitter reasons to regret. The Catholic league now forced him to reduce his army, and supplant Wallenstein by Tilly; while France was inciting Gustavus to the willing task of aiding the Protestants in Germany.

The war entered its third phase by the landing of the Swedes at Usedom (June, 1630), and their conquest of Pomerania and Mecklenburg. Gustavus, by the exercise of a little wholesome pressure, induced the elector of Brandenburg to aid him; and though unable to save Magdeburg (q.v.), he marched to join the Saxons, completely routed Tilly at Breitenfeld (Sept. 17, 1631); victoriously traversed the Main and Rhine valleys; again routed Tilly on the Lech (April 5, 1632), and entered Munich. By the judicious strategy of Wallenstein he was, however, compelled to return to Saxony, where he gained the great victory of Lützen (q.v.); but his death, depriving the Protestants of the only man who could force the confederate powers to preserve unity of action, was a severe blow to their cause; though the genius and indefatigable zeal of his chancellor, Oxenstierna, and the brilliant talents of the Swedish generals, preserved the advantages they had gained, till the crushing defeat of Bernard of Weimar at Nordlingen (Sept. 6, 1634) again restored to the emperor a preponderating influence in Germany. Saxony now made peace at Prague (May 30, 1635), obtaining such satisfactory terms for the Lutherans that the treaty was within three months adhered to by all the German princes of that sect, and the Calvinists were left to their fate.

Final success now appeared to demand only one more strenuous effort on the part of Austria; but Oxenstierna, resolved to preserve to Sweden her German acquisitions, propitiated Richelieu (q.v.) by resigning to him the direction of the war; and the conflict advanced into its final and most extended phase. The emperor, allied for offense and defense with the Lutherans, was now also assailed through his ally, Spain, who was attacked on her own frontier, in the Netherlands, and in Italy; Bernard of Weimar fighting independently, with the view of obtaining Alsace for himself, opposed the leaguers, while the Swedes, under Baner, held North Germany, and by frequent flying marches into Silesia and Bohemia, distracted their opponents, and prevented them, after their successes over duke Bernard, from proceeding with the invasion of France. The great victory of Baner over the Austrians and Saxons at Wittstock (Oct. 4, 1636), restored to Sweden the victor's wreath she had lost two years before; and from this time, especially under Torstensson (q.v.) and Königsmark, the Swedes were always successful, adding a second victory of Breitenfeld (Nov. 2, 1642), one at Yankowitz (Feb. 14, 1645), and numberless ones of less note, to their already long list of successes, carrying devastation and ruin into the hereditary territories, even to the gates of Vienna, defeating the best generals of the empire, till, from a profound feeling of inability to check them, the Austrians hardly dared appear to the north of the Danube. On the Rhine the leaguers at first had great success—the Weimar troops, now in French pay, were almost exterminated at Duttlingen (Nov. 24, 1643); but after the Spanish power had been thoroughly broken in the Netherlands by Condé, the French were re-enforced on the Rhine; and under Condé and Turenne (q.v.) rolled back the leaguers through the palatinate and Bavaria, and revenged at Nordlingen (Aug. 3, 1645) the former defeat of the Swedes. The emperor was now deserted by all his allies except the duke of Bavaria, whose territories were already mostly in the hands of Turenne and Wrangel; and a combined invasion of Austria from the w. and n. was on the point of being executed, when, after seven years of diplomatic shuffling, with an eye to the changing fortunes of the contest, the peace of Westphalia (q.v.) put an end to this terrible struggle.

THISTLE, *Carduus*, a genus of plants of the natural order *compositæ*, sub-order *cynarocephalæ*, with spinous leaves, imbricated involucre, and heads of flowers, consisting of tubular hermaphrodite florets alone, very rarely diœcious, stamens free, pappus deciduous, the receptacle having chafly bristles. The flowers are sometimes large, generally purple, rarely white or yellowish. Recent botanists have divided this genus into two genera—the true thistle (*carduus*), in which the pappus is composed of simple hairs, and the plume thistle (*cirsium* or *cnicus*), in which the pappus is feathery.—The species of both genera are numerous, and are found in most of the temperate and cold parts of the northern hemisphere, annual, biennial, and perennial herbaceous plants of considerable size.—The MILK THISTLE (*carduus marianus*), a biennial, native of Britain, and other parts of Europe, attains a height of 4 to 6 ft., and is remarkable for the milky veins of its large waved leaves. The bractæ of the involucre are sub-foliateous and recurved. The young leaves are sometimes used as a spring salad. Blanched leaves are used in winter salads. They are also used as a boiled vegetable, along with the

young stalks, after these have been peeled and soaked in water to extract part of their bitterness. The root is used as salsafy. In former times, the plant was frequently cultivated.—The creeping plume thistle (*Cirsium arvense*, or *enicus arvensis*), a species about 1 to 3 ft. high, with creeping roots, pinnatifid leaves and numerous diœcious flowers, is a very troublesome weed in fields, very common in Britain, and now too common, not only in Europe, where it is indigenous, but in America and other countries to which it has found its way. *Cirsium lanceolatum* and *C. palustre*, both common British plants, are also regarded as troublesome weeds. The former has larger flowers than any of the other species common in Britain. *Cirsium oleraceum* is a native of the n. of Europe, but not of Britain, distinguished by its yellowish flowers, which are surrounded with large yellowish involueral bractææ. The young leaves are used as a culinary esculent.—The BLESSED THISTLE (*carduus benedictus* of the pharmacopœias, *enicus benedictus* or *cirsium benedictum* of modern botanists) is a native of the Levant and of Persia, resembling in appearance a *centaurea*; with yellow flowers enveloped in leaves, and abounding in a gossamer-like down. The whole plant has a very bitter and disagreeable taste, and besides a bitter extractive, contains much sulphate and muriate of potash and sulphate of lime. It is a powerful laxative- tonic medicine, and a strong decoction of it readily induces vomiting.—The COTTON THISTLE (*onopordon*) is a distinct genus, known by its receptacles being destitute of bristles, and coarsely and deeply honey-combed. The common cotton thistle (*O. acanthium*), a native of Europe, and found in England, but rarely wild in Scotland, if, indeed, it is a true native of that country, is, nevertheless, very generally called by gardeners and others the SCOTCH THISTLE. The national emblem of Scotland is not, in all probability, any one species of thistle in particular, as botanically distinguished; though the stemless thistle (*enicus acaulis*, or *cirsium acule*) is in many districts of Scotland so designated. According to the common tradition, the Danes (or Norsemen?) came upon the Scots unperceived in the dead of night; and halting while their spies were trying to discover the undefended points of their opponents' camp, one of the spies chanced to tread upon a thistle of this species, and the loud imprecation which the sudden pain evoked aroused the unsuspecting Scots, who at once attacked the invaders, gained a complete victory, and dubbed the plant which had been the means of their success the Scotch thistle. The cotton thistle has large elliptic leaves, and a broadly winged stem. The young fleshy root and the stem, while still tender, are in many places boiled and eaten. The expressed juice of the plant was formerly reckoned good for cancerous sores and cutaneous eruptions.—Plants of the genus *silybum*, distinguished by its monadelphous stamens, and of the genus *echinops*, which has a very different manner of growth, and belongs to a very different section of the *composite*, are often to be seen in flower-gardens, where they are known as thistles. The name is also, generally with some addition, very often bestowed upon many plants which have little resemblance to any of these, except in their spinous character. *Centaurea calcitrapa* is commonly known as the STAR THISTLE (see CENTAUREA).—The CARLINE THISTLE (*carlina vulgaris*) is pretty common in dry hilly pastures in some parts of Britain.

THISTLE, ORDER OF THE, called also the order of St. Andrew (q.v.). The following is a more complete account of the institution of the order than is given in the article referred to: The order is of no very ancient date. The earliest-known mention of the thistle as the national badge of Scotland is in the inventory of the effects of James III., who probably adopted it as an appropriate illustration of the royal motto, *In defense*. Thistles occur on the coins of James IV., Mary, James V., and James VI.; and on those of James VI. they are for the first time accompanied by the motto, *Nemo me impune lacesset*. A collar of thistles appears on the gold bonnet-pieces of James V. of 1539; and the royal ensigns, as depicted in sir David Lindsay's armorial register of 1543, are surrounded by a collar formed entirely of gold thistles, with an oval badge attached. This collar, however, was a mere device until the institution, or, as it is generally but inaccurately called, the revival of the order of the thistle by James VII. (II. of England), which took place on May 29, 1687. Statutes were issued, and eight knights nominated by James; but the patent for the institution of the order never passed the great seal. After falling entirely into abeyance during the reign of William and Mary, the order was revived by queen Anne, Dec. 31, 1703.

THISTLEWOOD CONSPIRACY, a conspiracy formed in 1820 by Arthur Thistlewood, a man of profligate habits, and a few other adventurers of desperate fortunes, to overturn the government of Britain, and assassinate the ministers of the crown. The opportunity was to be taken of the funeral of George III., when all the military would have left London for Windsor, to take possession of London, and plunder the shops. The ministers were to be massacred when assembled at a cabinet dinner, and the pieces of cannon in Gray's Inn lane and the artillery ground were at the same time to be seized. A provisional government was to be established, and means taken to intercept communication with Windsor and Woolwich, and prevent any one from leaving England by sea. The conspirators were surprised, and most of them apprehended by the police in the garret in Cato street, where their meetings were held, on Feb. 23, the same day which had been fixed for the massacre of the ministers. A few turned king's evidence against

the rest; and Thistlewood and four others suffered the penalty which the law annexed to treason.

THO LEN, an island in the Netherlands, province of Zealand, bounded on the s. by the Easter Scheldt, contains about 34,000 acres of rich land, and is defended from floods by strong dykes, the borders of which are planted with trees. Pop. 14,078. Wheat, rye, barley, oats, beans, and potatoes are extensively grown. The annual produce of madder reaches a million of pounds-weight, and of flax 400,000. Horses, cattle, sheep, and swine are kept in large numbers. Tholen, the chief town, with a pop. of 2,540, is situated in the s.e. corner of the island,

THOLUCK, FRIEDR. AUG. GOTTREU, a German Protestant theologian whose reputation is perhaps greater in England and America than at home, was born at Breslau, March 30, 1799, and studied, first, at the university of his native city, and afterward at Berlin, where oriental studies claimed his special regard, the first fruits of which was his *Suffismus sive Theosophia Persarum Pantheistica* (Berl. 1821). The state of his religious opinions may be conceived from his own confession, that when he left Breslau, he thought nearly as much of Mohammedanism as of Christianity. The influence of Neander, however, and still more of baron von Kottwitz, a philanthropic Christian nobleman, of Silesia, produced a radical change in his convictions and modes of thought, and as early as 1823 he appeared as a champion of evangelical doctrines in his *Wahre Weihe des Zueifers* (True Consecration of the Skeptic; 7th ed. published at Hamb. 1851, under the title of *The Doctrine of Sin and the Propitiator*, and translated into English, French, Danish, Swedish, and Dutch). Next year he published his *Auslegung des Briefs an die Römer* (Exposition of the Epistle to the Romans; Berl. 1824; 4th ed. 1842; also translated into English and other languages). About the same time he was appointed extraordinary professor of theology at Berlin, and in 1827 he paid a visit to England. On his return in 1826 he succeeded Knapp as ordinary professor of theology at Halle, where, with the exception of a brief official sojourn at Rome, he has ever since remained. Tholuck's position at Halle, was far from pleasant at first, for the majority of the theological faculty, among whom was Gesenius, were very decided rationalists, and did all in their power to make the new professor miserable, but the latter, though not a man of very powerful intellect, was filed with a quiet, earnest, resolute faith, and he continued his evangelical labors in spite of all opposition, until they were crowned with success. The university of Halle is at present, mainly owing to Tholuck, as thoroughly Christian, though not, perhaps, so strictly orthodox, as it was in the days of Francke. His kindness (and that of his wife) toward students, especially poor students, is proverbial, and has contributed not a little to his fame abroad. In 1843 he was chosen a member of the consistory of Magdeburg, where he became superior counselor in 1867. Besides the works already mentioned, we may specify among his exegetical writings his *Praktischer Commentar zu den Psalmen* (Practical Commentary on the Psalms; Hamb. 1843); *Commentar zum Evangelium Johannis* (Commentary on the Gospel of John; 6th ed. Hamb. 1844); *Commentar zum Briefe an die Hebräer* (Commentary on the Epistle to the Hebrews; 3d ed. Hamb. 1850); *Philosophisch-theologische Auslegung der Bergpredigt* (Philosophico-theological Exposition of the Sermon on the Mount; 3d ed. Hamb. 1845). Of his dogmatic writings, the principal are contained in the *Literarischer Anzeiger für Christliche Theologie und Wissenschaft*, a journal now discontinued; and in his *Glaubwürdigkeit der Evang. Geschichte* (Credibility of the Gospel History; Hamb. 1837); a treatise directed against Strauss's *Leben Jesu*. Among his contributions to history of theology are to be reckoned his *Vermischte Schriften grösstentheils apologetischen Inhalts* (2 vols. Hamb. 1839); *Der Geist der Luth. Theologen Wittenbergs im 17. Jahr* (The Spirit of the Lutheran Theologians of Wittenberg in the 17th Century; Hamb. 1852); *Das Academische Leben des 17. Jahrh* (The Academic Life of the 17th Century; Halle, 1853-54); and his *Geschichte des Rationalismus* (History of Rationalism), of which several parts—notably a *Vorgeschichte des Rationalismus*—have already appeared, but which is still unfinished. Besides these may be mentioned several volumes of sermons. Tholuck died at Halle, June 9, 1877.

THOMAS, a co. in s.w. Georgia, adjoining Florida, drained by the Ocklockonee river, and its branches; traversed by the Atlantic and Gulf railroad; about 900 sq.m.; pop. '80, 20,598—12,214 colored. The surface is level. The soil is fertile. The principal productions are corn, wool, cotton, oats, rice, and live stock. Co. sent Thomasville.

THOMAS, a co. in n.w. Kansas, drained by the n. and s. forks of Sappa creek, by the head-waters of the Saline river, and the n. and s. forks of Saline river, about 1075 sq.m.; pop. '80, 161—136 of American birth. The surface is rolling. The soil is fertile. The principal productions are corn, wheat, hay, and cattle.

THOMAS, or **DIOMYS**, one of the twelve apostles, both of whose names signify "a twin." One of the records concerning him in John's gospel has led to his being unduly condemned as a doubter. It speaks only of his asking evidence, such as the other disciples had had, on which to rest his faith. There are various traditions concerning his labors and martyrdom, as the earlier say, in Persia and as the later, on the Malabar Indian coast. Several Roman Catholic theologians assert that traces of his presence in America are found from Paraguay to Mexico, in which last country Spanish priests pretend that the

Aztec divinity Quetzalcoatl was the apostle Thomas, who introduced those features of the Aztec religion which resemble Christian and Jewish rites.

THOMAS, GEORGE HENRY, 1816-70, b. Va.; was of mixed Welsh and French descent; entered the U. S. military academy at West Point in 1836, and graduated in 1840. He was employed in garrison duty for a brief period, and was then for two years in active service in the Florida war, and brevetted 1st lieut. for gallantry. In 1845 he was in Texas; was present at the outbreak of hostilities with Mexico; and distinguished himself at Monterey and Buena Vista, being brevetted capt. and maj. for gallant conduct. After the close of the Mexican war he served a year in Florida; three years as cavalry and artillery instructor at West Point; and then as maj. 2d cavalry, for five years in Texas. Thomas's associations had all been southern; his family and friends at home were Virginians; A. S. Johnston was col. of his regiment, Robert E. Lee lieut. col., and W. J. Hardee senior maj.; while other officers were Van Dorn, Kirby Smith, Fitz Hugh Lee, and Hood. But he adhered to the Union cause; was lieut. col. and afterward col. of the 2d cavalry; commanded a brigade in the first Shenandoah campaign, a division in the battle of Mill Spring—when he first began to awaken national attention, and was in command of the right wing of the army of the Tennessee during the siege of Corinth, where he was in full command during a great part of June, 1862. He had the center of the army of the Cumberland, and did good work at Murfreesboro; commanded the 14th army corps in the campaign of middle Tennessee in the summer of 1863; and at the ill-starred battle of Chickamauga Thomas stood firm, and resisted the concentrated attack of a victorious enemy; gaining justly the title of "the rock of Chickamauga." He commanded the army of the Cumberland at Missionary Ridge, and in the campaign of 1864, up to the capture of Atlanta. His indomitable nerve and firmness enabled him to hold his ground at Nashville, where he was envied by Hood's army; and despite urgent pressure, to remain inactive until he was ready for the final blow. When that happened, which was on Dec. 15, '64, he flung his army upon Hood with a determination and power which were irresistible; and the defeat of the confederates bore testimony to the coolness which accomplished one of the most splendid victories of the war. Gen. Grant, who had even designed assuming his command on account of the delay, was the first to acknowledge the unerring judgment of gen. Thomas. He was at once appointed a maj. gen. in the regular army; congress tendered him a vote of thanks; the legislature of Tennessee voted him a gold medal; and the American people recognized his ability and his success with unstinted praise. In 1865-66 gen. Thomas commanded the military division of the Tennessee, and the department of Tennessee the following year. He was afterward transferred to the 3d military district; and to the department of the Cumberland in 1867-69. From May 15, '69 until his death, which occurred Mar. 28, 1870, he was in command of the military division of the Pacific, with headquarters at San Francisco, where he died. His remains are buried at Troy, N. Y., and there is in Washington a monument to his memory.

THOMAS, ISAAH, LL.D., 1749-1831; b. Boston; after an apprenticeship of 11 years began business as a printer at Newburyport, 1767. His career is noteworthy: 1. *As a journalist.* Having removed to Boston he published the *Massachusetts Spy*, 1770; and continued it afterward at Worcester. 2. *As a patriot.* He boldly denounced the oppression of the colonies by the British government, and took part in the skirmish at Lexington. 3. *As a publisher.* He opened a bookstore at Boston, and in days when communication with distant places was so limited, established branches of his business in several parts of the United States. He printed a folio edition of the Bible, 1791, and afterward many editions of smaller size. For many years he was one of the principal printers and publishers of school books for the whole country. In 1810 he published a *History of Printing in America* (2 vols., 8 vo). 4. *As a friend of science and literature.* He exerted himself to establish the American antiquarian society of Worcester and endowed it liberally.

THOMAS, JOHN, 1725-76; b. Mass.; became eminent as a physician, and was a member of Shirley's medical staff in 1747. He was made a col. of the provincial forces in 1759, led a regiment at Crown Point the next year, and was at the capture of Montreal. He was one of the "sons of liberty," and a member of the provincial congress. He was appointed maj. gen. in 1776, and during the siege of Boston was at the head of a brigade on the Roxbury side. On the night of Mar. 4, 1776, with a force of 3,000 men, he occupied Dorchester heights, and threw up intrenchments. This movement forced the evacuation of the town by the British, Mar. 17. He afterward commanded the army in Canada, but was forced to retreat on account of the smallness of his force, and the ravages of the small-pox, of which he soon died.

THOMAS, JOHN J., b. N. Y., 1810; son of David, writer on agriculture and pomology, assistant editor of the *Genesee Farmer*, 1834-39; *Albany Cultivator*, 1841-53; and of the *Country Gentleman*. He has published works on fruit-culture, farm implements, and farm machinery.

THOMAS, JOSEPH, LL.D., b. N. Y., 1811; educated at Yale college, and became a physician. He spent the years 1857-58 in India, engaged in the study of the oriental languages, and afterward studied in Egypt. He was prof. of Latin and Greek at Hav-

erford college, Penn. In association with Thomas Baldwin he published in 1845 *A Pronouncing Gazetteer*, which went through several editions and has been several times revised; and in 1854 *A New and Complete Gazetteer of the United States*. Among his other works are *Travels in Egypt and Palestine* (1853); *A Comprehensive Medical Dictionary* (1864); and a *Universal Pronouncing Dictionary of Biography and Mythology* (1871). *Webster's Unabridged Dictionary* is supplied with his "pronouncing vocabularies;" of proper names, in which department his work has high authority.

THOMAS, THEODORE, b. Germany, 1835; received his musical education from his father, and played the violin at public concerts when only six years of age. He came with his parents to America in 1845, and was a member of the orchestra of the Italian opera in New York. He played first violin in the first American concert tour of Jenny Lind. In 1861 he began the formation of his famous orchestra, and in 1864 gave his first symphony concerts in New York. In 1866 he instituted his summer-night festivals. In 1869 he conceived the idea of traveling during the time unoccupied in New York, and for nine years he made an annual round of the principal American cities, which enabled other places to enjoy the services of his unrivalled orchestra. In 1878 he accepted the position of director of the college of music at Cincinnati, but disagreements arose, and in the spring of 1880 he resigned his position to return to New York. Since 1878 he has been the conductor of the New York and Brooklyn philharmonic societies, and the concerts given under his leadership have been of a highly artistic character.

THOMAS, THEODORE GAILLARD, b. S. C., 1831; took his medical degree at the South Carolina medical college. In 1862 he was chosen prof. of obstetrics and gynecology at the college of physicians and surgeons in New York city, and acted as visiting surgeon at the city hospitals. He has written many papers for medical periodicals, and is the author of a standard treatise on the diseases of women, which has been translated into French and German. As a medical lecturer he is admirably clear and instructive.

THOMASIUS, CHRISTIAN, a German philosopher and jurist, was born at Leipsic, Jan. 1, 1655; studied at Frankfort-on-the-Oder (1675-79), and, returning to his native town, commenced to lecture on law in a style perfectly free from the pedantry of the schools. In 1687, to the astonishment of his Latin-speaking colleagues, he adopted the German language as the vehicle of his expositions, published his programme for the following year in the same tongue, and commenced a monthly journal under the very German title of *Freimüthige, Lustige und Ernsthafte, jedoch Vernünft- und Gesetzmässige Gedanken oder Monatsgespräche über Allerhand, Vornehmlich aber neue Bücher* (Honest, Merry, Sincere, yet Rational and Moderate Thoughts, or Monthly Talk concerning all Sorts of Books, but especially New Ones). This work, however, excited so much opposition that he was forced to leave Leipsic, and went first to Berlin, and afterward (1690) to Halle, where, under the patronage of the Brandenburg court, his lectures were the means of establishing a university, since famous. In this university Thomasius became professor of jurisprudence, and here he died, Sept. 23, 1728. The great aim of Thomasius was to harmonize and blend science and life; hence his contempt for hair-splitting subtleties of which nothing could be made; his preference for the use of German rather than Latin in his academic lectures; his disinclination to all philosophical terminology, his depreciation of the school-men, etc. But more particularly he was among the first who insisted on dissociating natural right from morality, and, in connection therewith, honorably signalized himself as a courageous opponent of trial for witchcraft and punishment by torture. The characteristic features of his mode of thought are contained in his *Vernünftige und Christliche aber nicht Scheinheilige Gedanke und Erinnerungen über Allerhand Auserlesene, Gemischte, Philosophische und Juristische Händel* (Rational and Christian, but not pretend-edly Pious Thoughts and Recollections concerning sundry Choice, Mixed, Philosophical, and Juristic Transactions, 3 vols. Halle, 1723-26); and in his *Geschichte der Weisheit und Thorheit* (History of Wisdom and Folly).—See Luden, *Christian Thomasius nach seinen Shucksalen und Schriften* (Berl. 1805).

THOMAS, ST., the island. See SAINT THOMAS, *ante*.

THOMAS THE RHYMER, a name given to the earliest poet of Scotland. The history of his life and writings is involved in much obscurity; but it is generally believed that Thomas Learmount of Ercildoune was the person whose poems and prophecies were extensively known among the people of Scotland at an early period. The rhymr derived his territorial appellation from the village of Ercildoune, in the county of Berwick, situated on the river Leader, about 2 m. above its junction with the Tweed. The time of his birth is unknown; but he appears to have reached the height of his reputation in 1283, when he is said to have predicted the death of Alexander III., king of Scotland. This singular prophecy is recorded in the *Scotichronicon* of Fordun in 1430, who relates that one day the rhymr, when visiting at the castle of Dunbar, was interrogated by the earl of March, in a jocular manner, if to-morrow should produce any remarkable event. The rhymr is reported to have expressed himself to the effect: "Alas for to-morrow, a day of calamity and misery! Before the twelfth hour shall be heard a blast so vehement that it shall exceed all those which have yet been heard in Scotland—a blast which shall strike the nations with amazement, shall confound those who hear it, shall humble what is lofty, and what is unbending shall level with the ground." On the following day the earl, who had been unable to discover any unusual appearance in the weather, when

seating himself at table observed the hand of the dial to point to the hour of noon; while, at the same moment, a messenger appeared bringing the mournful tidings of the accidental death of Alexander at Kingorn.

From this and other prophecies the rhymmer became popularly known as "true Thomas," and was believed to have derived his skill from his intercourse with the queen of fairyland. The legend bears that he was carried off at an early age to fairyland, where he acquired all the knowledge which made him so famous. After seven years' residence there he was permitted to return to the earth to enlighten and astonish his countrymen by his prophetic powers, still remaining bound to return to his royal mistress when she should intimate her pleasure. Accordingly, while the rhymmer was making merry with his friends in his tower at Ereildoune, a person came running in, and told, with marks of fear and astonishment, that a hart and hind had left the neighboring forest, and were composedly and slowly parading the street of the village. The rhymmer instantly rose, left his habitation, and followed the animals to the forests, whence he was never seen to return. The Eildon tree, where he delivered his prophecies, no longer exists; but its site is marked by a large stone called the Eildon tree stone. A neighboring rivulet takes the name of the Bogle (or goblin) burn from the rhymmer's supernatural visitants.

The earliest edition of the prophecies of the rhymmer was published in Edinburgh, by Waldegrave, in 1603. See also, *The Romance and Prophecies of Thomas of Ereildoune*, by J. A. H. Murray, LL.D. (1876).

Allusions to the rhymmer occur in Wynton's *Chronicle*, blind Harry's *Wallace*, and other ancient Scottish authors. In Bellenden's translation of Boece, printed in 1535, it is stated that "this Thomas wes ane man of gret admiration to the pepil; and schew syndry thingis as they fell, howbeit thay wer ay hid under obscure wourdis." In the poems of Robert of Brunne, who flourished about 1303, there is an incidental notice that the rhymmer had composed a version of the incomparable romance of *Sir Tristrem*. It was long a subject of inquiry to Scottish antiquaries where this literary treasure might exist; until a copy of it was discovered by Mr. Ritson in the Auchinleck manuscript, preserved in the Advocates' library, which was edited by sir Walter Scott in 1804. The merits of this romance are of a very high order, and the rhymmer must be regarded as having possessed a poetical genius superior to any of his contemporaries.

The time of the death of the rhymmer, like that of his birth, is a matter of conjecture; but he must have died before 1299 (the date of a charter in which his son calls himself "Filius et hæres Thomæ Rymour de Ereildon)."

THOMASVILLE, seat of justice of Thomas co., Ga., on the Savannah, Florida and Western, and the Atlantic and Gulf railroads; 200 m. s.w. of Savannah; pop. '80, 2,957. It has considerable trade from the surrounding country, which is fertile; it contains a court-house, the Fletcher institute for boys, a college for women, a bank, an iron foundry and machine-shops. It is in the s.w. corner of the state, on high land, and has become a favorite resort for invalids from the north, suffering from pulmonary diseases.

THOMASTON, a town and port of Maine, U. S., on the St. George river, 15 m. from the coast, and 80 m. e.n.e. from Portland. Its extensive granite quarries are worked by the convicts of the state prison; 300,000 casks of lime are exported annually; registered shipping, 60,000 tons; 5 churches, 2 public libraries. Pop. '70, 3,092.

THOMISTS. See AQUINAS.

THOMPSON, a co. in s.e. central Dakota, drained by the Dakota river, and its n. fork; about 900 sq. miles. The surface is rolling. The soil is fertile and well adapted to stock raising.

THOMPSON, AUGUSTUS CHARLES, D.D., b. Conn., 1812; educated at Yale college, East Windsor theological seminary, and the university of Berlin; became pastor of the Eliot Congregational church, Roxbury, Mass., 1842. He visited India with Dr. Anderson, 1855-56. His publications are: *Songs in the Night*; *The Lambs Fed*; *The Young Martyrs*; *Last Hours, or Words and Acts of the Dying*; *The Better Land*; *The Poor Widow*; *Gathered Lilies, or Little Children in Heaven*; *Feeding the Lambs*; *Morning Hours in Patmos*; *Lyra Cælestis*; *Christus Consolator*; *The Mercy Seat*.

THOMPSON, CEPHAS G., b. Middleboro', Mass., about 1812; inherited love of art from his father, a portrait painter; went to reside in Plymouth at the age of 18, and began to paint portraits. He entered the studio of D. C. Johnson in Boston, and had access to the Boston atheneum. He subsequently removed to Providence, R.I., resided in New York, 1837-47, in New Bedford, Mass.; in Italy, 1852-60; making one of a circle of young American artists and sculptors since known to fame. Returning to New York he has since resided in that vicinity. Among his best-known works are copies of the Staffa "Madonna" of Raphael, and "Beatrice Cenci," among his own conceptions are the "Angel of Truth," "Liberation of St. Peter," "The Mother's Prayer," "Chastity," etc. His brother Jerome is a landscape painter.

THOMPSON, DANIEL PIERCE, 1795-1868; b. Mass.; graduated at Middlebury college, 1820; became a private tutor in Virginia; studied law and was admitted to the bar of that state. He returned to Vermont, 1824, practiced in Montpelier, and held several legal offices. In 1853 he became secretary of the state. He wrote seven or eight novels, of which *The Green Mountain Boys* (1840), and *The Rangers* (1850), both revolutionary

stories, were very popular. He also wrote a history of Montpelier (1860); and *Laws of Vermont* (1835).

THOMPSON, ELIZABETH, b. England, about 1850; studied art, and in 1874 exhibited at the Royal academy, London, a painting called "The Roll Call," the most successful picture of the year. This was afterward purchased by the queen. With the exception of a "Vintage Sketch in Tuscany," her other works are from military subjects, the "Battle of Balaklava" being the most important.

THOMPSON, Sir HENRY, b. England, 1820; a student at University college, London. He was professor at University College hospital of clinical surgery, 1866, and became surgeon to the late king of Belgium in 1863, and to the present king in 1866. He was knighted in 1867. He has published *The Pathology and Treatment of Stricture of the Urethra; The Enlarged Prostate, its Pathology and Treatment; Practical Lithotomy and Lithotrity*, and other works.

THOMPSON, JACOB, b. N. C., 1810; graduate of the university of North Carolina, 1831; studied law; admitted to the bar, 1834; a Mississippi pioneer; settled in the Chickasaw country; member of congress, 1839-51 chairman of the committee on Indian affairs. A zealous defender of his state and a strong partisan, he worked indefatigably for the interests of the democratic party; was appointed secretary of the interior, 1857; holding the office 4 years; resigning for reasons connected with the re-enforcement of fort Sumter. He was one of the commissioners from the state of Mississippi to North Carolina to urge the adoption of an ordinance of secession; gov. of Mississippi, 1862-64. In the rebellion he was inspector-gen. of the department of the Mississippi, and aid to Beauregard.

THOMPSON, JOHN R., 1823-73; b. Conn.; graduated at the university of Virginia, 1843; studied law, and in 1845 was admitted to the bar. He is best known as the editor of the *Southern Literary Messenger*, which he controlled, 1847-61. Near the end of the war he went to England and wrote articles in defense of the cause of the confederacy in *Blackwood's Magazine*, the *Cornhill*, and other periodicals. He afterward resided in New York, and was a contributor to the *Evening Post*.

THOMPSON, JOSEPH PARRISH, D.D., LL.D., 1819-79; b. Philadelphia; graduated at Yale college 1838; studied theology at Andover and New Haven; ordained pastor of Chapel street Congregational church, New Haven, 1840; minister of Broadway Tabernacle church (Cong.), New York, 1845-71. He was one of the originators of the *New Englander* and the *Independent*, and associate editor of the latter. He visited Europe and the east, 1852-54. From 1873 until his death he resided in Berlin. His publications, besides sermons, addresses, and pamphlets are: *Memoir of Timothy Dwight; Lectures to Young Men; Hints to Employers; Memoir of David Hale; Foster on Missions*, with a preliminary essay; *Stray Meditations; The Believer's Refuge; The Invaluable Possession; Egypt, Past and Present; The Early Witnesses; Memoir of Rev. David T. Stoddard; The Christian Graces; The College as a Religious Institution; Love and Penalty; Bryant Gray; Christianity and Emancipation; The Holy Comforter; Man in Genesis and Geology; Theology of Christ from His Own Words; Home Worship; Church and State in the United States*; lectures given in Berlin; *Life of Christ; Lectures on The Centennial of American Independence*, at Berlin, Dresden, Florence, Paris, and London; *The Workman, His False Friends and His True Friends*. Dr. Thompson devoted much time to oriental studies, especially Egyptology, the fruits of which have appeared in the *North American Review*, *Bibliotheca Sacra*, *Journal of the American Geographical and Statistical Society*, *Smith's Dictionary of Biblical Geography and Antiquities*; Kitto's *Cyclopedia of Biblical Literature*. Few men in literary and professional life have shown such industry, with such versatility and uniformity of power in widely varying departments.

THOMPSON, LAUNT, b. Ireland, 1833; came to the United States when a boy; studied drawing and modeling in the studios; and in 1858 opened a studio in New York, where he has since resided when not in Italy. Among his best known works are the statues of gen. Sedgwick, of Winfield Scott, and of Napoleon, the soldiers' monument at Pittsfield, Mass., and a statue of Abraham Pierson, first president of Yale college, now in the college grounds.

THOMPSON, MORTIMER M., 1831-65; studied at Michigan university, but did not graduate. A series of humorous letters in the *Detroit Advertiser* secured him a connection with the New York press. His humorous books were at one time quite popular. Among them are: *Doesticks—What he says* (1850); *History and Records of the Elephant Club* (1857); and *Nothing to Say* (1857).

THOMPSON, THOMAS PERRONET, 1783-1869; b. England; graduated at Queen's college, 1802; served three years in the navy and then joined the army. He took part in the Buenos Ayres campaign, 1807; and in 1808 was made governor of Sierra Leone. His recall to England, 1810, was said to be due to the influence of the slave traders, against whose traffic he had taken active measures. He was with the British army in the peninsular and French campaigns of 1813 and 1814, and in the Indian Pindaree campaign. He was afterward engaged in negotiations for the suppression of the slave trade by treaty. In 1824 he was one of the founders of the *Westminster Review*, and contrib-

uted many papers on a very wide range of topics. Gen. Thompson was a member of parliament, 1835-57.

THOMPSON, WADDY, 1798-1868; b. S. C.; son of judge Waddy; graduate of South Carolina college, 1814; admitted to the bar, 1819; member of the S. C. legislature, 1826-30. He was at one time solicitor for the w. circuit; brig.gen. of state militia; member of congress, 1835-41. He was chairman of the committee on military affairs, 1840; minister to Mexico, 1842, when his diplomatic services accomplished the release of 200 Texan prisoners. Subsequently he became a cotton planter in Florida, but resided in South Carolina. He published *Recollections of Mexico* (1846).

THOMPSON, WILLIAM, 1730-81; b. Ireland; settled in Pennsylvania, and was a capt. in the militia of that state in the French war, 1759-60. He led a regiment of Pennsylvania riflemen to Cambridge, in 1775, and skirmished with the British at Lechmere point soon after his arrival. Made a brig.gen. in 1776, he was Lee's successor at New York, and soon afterward joined the army in Canada. Captured at Three Rivers, where he led the attacking force, he remained a prisoner on parole at Philadelphia till 1778.

THOMPSON, ZADOC, 1796-1856, b. Vt.; educated at the university of Vermont. He took orders in the Episcopal church, and was appointed professor in the Vermont Episcopal institute. He was state geologist, 1845-48, and professor of chemistry and natural history in the university of Vermont, 1851-53. He was a commissioner to the universal exposition in 1851, and was appointed state naturalist in 1853. Among his works are a *Gazetteer of Vermont* (1824); *The History of Vermont, Natural, Civil, and Statistical* (1841-43); and *Geography and Geology of Vermont* (1848).

THOMPSONVILLE, a vill. in Enfield township, Hartford co., Conn., on the e. side of the Connecticut river, 17 m. n.e. of Hartford; on the New Haven, Hartford and Springfield railroad; pop. '80, about 3,000. There are several factories, the chief of which manufacture carpets, turning out over 2,000,000 yards yearly.

THOMS, WILLIAM JOHN, b. Westminster, England, 1803; contributor to the *Foreign Quarterly Review*, and other periodicals, while clerk in the secretary's office of the Chelsea hospital; fellow of the society of antiquarians, 1838, and of similar societies in Edinburgh and Copenhagen; 1838-73, sec. of the Camden society. He was the founder and editor of *Notes and Queries*, retired 1873. He published a *Collection of Early Prose Romances* (1828); *Lays and Legends of Various Nations* (1834); *Three Notelets on Shakspeare* (1835).

THOMSON, ANTHONY TODD, 1773-1849; b. Edinburgh; educated at the university of Edinburgh, where he took the degree of M.D. 1799; began practice in London in 1800. He held the professorships of *materia medica* and medical jurisprudence in the London university, 1832-49, and was editor of the *Medical Depository*. He was the author of the *London Dispensatory* (1811); and wrote and edited many medical treatises and papers. His wife, KATHARINE BYERLEY THOMSON, 1800-62, wrote several novels and, jointly with her son, John Cockburn Thomson, published under the names of Grace and Philip Wharton several volumes of memoirs and biographical incidents, such as *Life and Times of George Villiers, Duke of Buckingham*; *Memoirs of Sir Walter Raleigh*, etc.

THOMSON, CHARLES, LL.D.; 1729-1824; b. Ireland; emigrated to America in 1740; was educated in Maryland, and entered business in Philadelphia, where he enjoyed the intimacy of Franklin. He was sec. of the continental congress, 1774-88, and of the U. S. house of representatives, 1788-89. He wrote on Indian affairs, and a *Synopsis of the Four Evangelists* (1815).

THOMSON, EDWARD, D.D., LL.D.; 1810-70; b. England; came to America, 1819; studied medicine in Philadelphia and Cincinnati; began practice at Wooster, Ohio, 1829; joined the Methodist conference, 1833, and was stationed at Norwalk, Sandusky, Cincinnati, Wooster, Detroit; president of Norwalk seminary, 1837-44; professor of mental and moral philosophy in university of Michigan, 1843; elected president of Ohio Wesleyan university, 1846; elected bishop, 1864, and soon afterward visited the Methodist missions in Germany, Bulgaria, India, and China, and organized the India mission into an annual conference. He published *Moral and Religious Essays*; *Biographical and Incident Sketches*; *Educational Essays*; *Letters from Europe*; *Letters from India, China, and Turkey*.

THOMSON, JAMES, author of *The Seasons*, was born on Sept. 11, 1700, at Ednam, in Roxburghshire, of which parish his father was minister. He was put to school at Jedburgh, and afterward sent to complete his education at Edinburgh. His intention was to enter the church, and he went through a full course of study with that object in view. His views, however, changed. From a very early age, he had been wont to express himself in verse; and in 1725 he betook himself to London to seek fame and fortune as a poet. Almost his sole capital for the enterprise seems to have been his manuscript poem of *Winter*. This, with some little delay and difficulty, he disposed of to a publisher for three guineas; and as its success was not instant, his outlook was by no means brilliant. Gradually, however, the merits of the poem were recognized; successive editions were called for; friends and patrons were not wanting to the young author, and in no long

time Thomson found himself as good as a made man and poet. The *Winter* was followed in 1727 by the poem *Summer*; *Spring* was published the year after; and *Autumn*, completing *The Seasons*, appeared in 1730, with a re-issue of the previous portions. In 1729, Thomson produced the tragedy of *Sophonisba*; but though great expectations were formed of it, its success on the stage, was but indifferent. A weak line which occurred in it—

O Sophonisba, Sophonisba, O,

as parodied by a wag in the pit into

O Jemmy Thomson, Jemmy Thomson, O,

afforded much merriment to the town, and somewhat killed the pathos of the author, otherwise with not much vitality in it. During 1730—1733, Thomson was abroad in Paris and elsewhere with the son of sir Charles Talbot, the chancellor; and on his return, at the death of his pupil, the comfortable place was bestowed upon him of secretary of the briefs. This he held till it lapsed, on the death of the chancellor in 1737, which left him once more in considerable straits, which were, however, a little alleviated by a pension of £100 a year given him by the prince of Wales. His tragedy of *Agamemnon*, produced in 1738, was, in Johnson's phrase, "only endured, but not favored;" and his poem on *Liberty*, by himself considered his greatest work, was little relished by the public. His *Tamerlud and Sigismunda*, produced in 1745, was the only one of his tragedies which had any success, and its success was not of a signal kind. About this time, the accession to power of his friend Mr. Lyttleton secured him the office of surveyor-general of the Leeward islands, which, however, he did not long live to enjoy. He died of a neglected cold in Aug., 1748, and was buried in the church of Richmond, without an inscription; but a monument was afterward erected to his memory in Westminster abbey. In the spring before his death he had published his finest poem, *The Castle of Indolence*. This piece, which is written in the Spenserian stanza, has all the descriptive power and opulence of imagination which distinguish his more popular *Seasons*, while in tone and diction it is much more chastened and harmonious. Together, they continue to maintain for Thomson a somewhat high place in the roll of British poets. Of his other works, with the exception of the song of *Rule Britannia*, nothing but the names is now remembered. As a man, Thomson was singularly amiable, and his careless, indolent generosity of disposition seems to have endeared him to all who knew him.

THOMSON, SAMUEL, 1769-1843; was the author of a *Materia Medica and Family Physician, New Guide to Health*, and *Life and Medical Discoveries, written by himself* (Boston, 1825), and originated the "Thomsonian," or botanic system medical practice.

THOMSON, THOMAS, 1768-1852; b. Ayrshire, Scotland; educated at the university of Glasgow, called to the bar in 1793; deputy-clerk registrar of Scotland, 1806; principal clerk of sessions, 1828-52. In 1832 he was elected president of the Ballantyne club. He was one of the founders of the *Edinburgh Review*, and occasionally a substitute for Jeffreys as editor. He superintended the publication of numerous works on historical, legal, biographical, and other subjects; among them Chambers's and Thomson's biographical dictionary of eminent Scots, 1855. Sir Walter Scott, who acknowledged himself his debtor, asserted that he understood more of old books, old laws, and old history than any other man in Scotland.

THOMSON, THOMAS, 1773-1852, b. Scotland; educated at St. Andrew's and Edinburgh. In 1796 he began to contribute to the *Encyclopædia Britannica* a series of articles on chemical subjects, afterward published a *System of Chemistry*, 4 vols., 1802. In 1817 he was appointed lecturer on Chemistry, and in 1818 prof. at the university of Glasgow. He was among the first to explain Dalton's atomic theory and to recommend the employment of chemical symbols. Among his works are *Elements of Chemistry* (1810); *Travels in Sweden* (1813); *History of Chemistry* (1830-31); *Outlines of Mineralogy and Geology* (1836); and *Breuing and Distillation* (1849).

THOMSON, WILLIAM, D. D., b. England, 1819; educated at Oxford, of which he was tutor, fellow and provost; ordained, 1842; select preacher at Oxford, 1846; Bampton lecturer, 1853; rector of All Souls, Marylebone, 1855; preacher of Lincoln's Inn, 1858; bishop of Gloucester and Bristol, 1861; archbishop of York, 1863. He is a member of several learned societies, president of the Palestine exploration fund, one of the lords of the privy council, governor of the Charter-house and of King's college. He has published *The Atoning Work of Christ*; *Outline of the Necessary Laws of Thought*; *Life in the Light of God's Word*; *Limits of Philosophical Inquiry*.

THOMSON, Sir WILLIAM, one of the few very great living mathematicians and natural philosophers, was b. in June, 1824. His father was prof. of mathematics in the university of Glasgow. Thomson graduated in 1845, as second wrangler and first Smith's Prizeman at Cambridge, where he was shortly afterward elected to a fellowship in St. Peter's college; and became prof. of natural philosophy in the university of Glasgow in 1846. This appointment he still holds. While still an undergraduate, he published several valuable papers. He was for some time editor of the *Cambridge Mathematical Journal*, and some of his most brilliant discoveries have appeared in its pages. He has

also contributed to the *Comptes Rendus*, the transactions and proceedings of the royal societies of London and Edinburgh, and various other journals. All his numerous writings have the stamp of originality in a marked degree. In the mathematical theories of elasticity, vortex-motion, heat, electricity, and magnetism, he has made remarkable discoveries; among which we need merely mention the dissipation of energy, the beautiful idea of electric images, and the complete solution of the problem of telegraphing through a submarine cable. Popularly, he is best known by his association with the Atlantic cable, a gigantic idea, which, but for his investigations, might, perhaps, not have been realized, or even attempted. On its successful completion, in 1866, he was knighted. He has invented several excellent and useful instruments for various electrical purposes—such as electrometers and galvanometers; instruments for the determination of electric units in absolute measure, etc. He is a remarkable instance of the combination of the very highest powers of reasoning with the practical skill of the mathematician and engineer. In conjunction with Prof. Tait, he published in 1867 the first volume of an extensive *Treatise on Natural Philosophy*; and his *Papers on Electrostatics and Magnetism* (a splendid monument of his genius) were collected and reprinted in 1872.

His elder brother, JAMES, prof. of civil engineering in Glasgow, has made various improvements in the construction of turbines and other engines (see WATER-POWER); but is best known by his splendid discovery that the freezing-point of water is lowered by pressure; and the glacier-theory he has founded upon it. See HEAT, ICE, REGELATION.

THOMSON, WILLIAM M., D. D., graduated at Miami university, 1828; went as a missionary of the American board to Syria and Palestine. He published *The Land and the Book*; *Biblical Illustrations, drawn from the Manners and Customs, the Scenes and the Scenery of the Holy Land*; *The Land of Promise*; and *Travels in Modern Palestine*.

THOMSONIAN SYSTEM. See THOMSON, SAMUEL.

THOR, the god of thunder, was the son of Odin and Earth (Yörd); his wife was Sif (= sib, friendship, love, and thus of the same import with Freyja). His palace, supported on 540 pillars, was called Thrudwanger; here he received the warriors that had fallen in battle. Thunder was caused by the rolling of his chariot, which was drawn by he-goats. He was in the vigor of youth, had a red beard, and was the strongest of all gods and men; the gods even called in his assistance when they were in straits. He was, in particular, a terror to the giants (q.v.), with whom he was perpetually at strife, and whom he struck down with his hammer Mjolnir (i.e., the smasher or mauler), which had the property of returning to his hand after being hurled; it had been made by cunning dwarfs. The sign of the hammer was among the heathen Teutons analogous to that of the cross among Christians. In the contest at the twilight of the gods, Thor slew the serpent of Midgard, but fell at the same time poisoned by the venom exhaled from its mouth. The name of Thor was widespread. The Saxons worshiped him as Thunar (high-German, *Donar*). Torden, the wrathful deity dreaded by the Lapps, who in his rage hurled down huge blocks from rocks, tore up trees, destroyed cattle and men, is evidently the Scandinavian Thor. The Gallic god Tarannis—in an old inscription Tanarus—mentioned by Lucan, appears also to be identical, especially as *torunn* in the Celtic languages still signifies thunder. The attribute of thunder is intimately associated with the Latin Jupiter and the Greek Zeus (see also INDRA). Of all the Asa-gods, Thor had unquestionably the most worshipers. In Upsala, according to Adam of Bremen, he occupied the place of honor in the temple between Odin and Frikke. In Norway, Thor was the national god, and here, as in Iceland, temples were almost exclusively erected to him. Offerings were made to him, particularly in times of pestilence. On the ground of the superior respect enjoyed by Thor, and of his being called "old Thor," some place him in opposition to Odin, and consider him historically as an older divinity, only partly supplanted by the Odin doctrine. As rude force is the predominating element in Thor, the humorous element of the Scandinavian belief attaches to him. Thus, the giants often blinded him by magic, and made fun of him; yet he always shows his extraordinary strength in these cases, and in the long-run his opponents are invariably overcome by the hammer. Thursday is so called from Thor; and the name survives in numerous names of places (Thunnesberg, in Westphalia; Thunderhill, in Surrey, Thurso), and also in personal names (Thorburn, in Scand. Thorbiörn). Compare Uhland, *Der Mythos von Thor* (Stutt. 1836); Grimme, *Deutsche Mythologie*.

THORACIC DUCT, a canal equal in diameter to a goose-quill, proceeding from the *receptaculum chyli* (into which the contents of the lacteals are collected, and which is situated in the front of the body of the second lumbar vertebra), ascends along the front of the vertebral column, between the aorta and ascending vena cava, as high as the fourth dorsal vertebra; it then inclines to the left, and passing behind the arch of the aorta, ascends as high as the seventh cervical vertebra, when it bends forward and downward, and terminates at the point of union of the subclavian and internal jugular veins of the left side, where it is provided with a pair of semilunar valves, which prevent the admission of venous blood into it. It is also provided with other valves on its upward course. This duct is not liable to any special diseases; but if its function of conveying chyle from its source into the general circulation be interfered with, as, for example, by the pressure of a tumor, the due nutrition of the system must be checked.

THORAX. See CHEST.

THORBURN, GRANT, 1773-1863; b. Scotland; a nail-maker who emigrated to New York for political reasons in 1794, and became a seedsman. Over the pseudonym "Lawrie Todd" he was a frequent contributor to periodical literature. Among his works are, *Forty Years' Residence in America* (1834); and *Fifty Years' Reminiscences of New York* (1845). John Galt's novel, *Lawrie Todd*, gives some account of him.

THOREAU, HENRY DAVID, 1817-62; b. Mass.; graduated, 1837, at Harvard; and for three years was engaged in school-teaching. He had considerable mechanical skill, and worked for his bare living at carpentering, surveying, etc., on a system of his own, which opposed devoting more time to such employment than was necessary for the procuring of the necessaries of life. This was, in his case, to enable him to pass as much of his life as was possible in study and contemplation; and he devoted most of his time to investigating nature, and reasoning out metaphysical theories and problems. He was an admirer of Homer, early English literature, and Orientalia. His observations of natural phenomena and animal life made him at last an authority on these subjects, though not in the character of a scientist. He was a minute observer of details, and had a most vivid appreciation of facts and incidents in the line of his studies. He never married; was somewhat eccentric in his habits and opinions; a vegetarian by preference; and humane to that degree that he never used a gun to aid him in obtaining specimens of natural history. He contributed infrequently to the *Dial* and other periodicals. In 1849 he produced his first published work, *A Week on the Concord and Merrimac Rivers*. This was a detailed account of a boat-voyage; and was succeeded in 1854 by his *Walden, or Life in the Woods*; mainly devoted to studies of insect, bird, and animal life. Others of his works are *The Maine Woods*; *Cape Cod*; *Excursions in Field and Forest*; etc.

THORIUM, or THORIUM (sym. Th, equivalent, in the old system, 57.8; new system, 115.6), is a rare metal, much resembling aluminum, but taking fire considerably below a red heat, and burning with great brilliancy. *Thorina*, or *thoria*, is supposed to be the protoxide, and is remarkable for its high specific gravity, 9.4. Thorium was discovered in 1829 by Berzelius in an earth to which he had given the name *thorina*, and which occurs in a rare black Norwegian mineral termed *thorite*. None of the compounds of this metal are of any practical importance.

THORN. See CRATÆGUS, Hawthorn, and SPINE.

THORN (Pol. *Torún*), a strongly-fortified t. of Prussia, in the s. of the province of West Prussia, on the right bank of the Vistula, 31 m. e.s.e. of Bromberg by railway. The town was founded in 1232, was a member of the Hanseatic league, and contains many houses—as the town-hall—remarkable for their beautiful gables and interiors. It is the birthplace of Copernicus, whose monument is to be seen in the *Johannis-Kirche*, and a bronze statue to whom was erected in the market-place in 1853. An active trade in corn and timber is carried on. Pop. '75, 18,667.

THORN, CONFERENCE OF, one of those efforts to explain away the differences between the several bodies of Christians, with a view to religious reunion, of which the 17th c. furnishes more than one example. The originator of this movement was the king of Poland, Ladislaus IV., who proposed his project for the consideration of a synod of the bishops of his kingdom held at Warsaw in 1643, and letters were addressed in consequence to all the several religious bodies in Poland, inviting them to send delegates to an assembly to be held at Thorn, for the purpose of the mutual explanation of their doctrines, with a view to the removal of all differences of belief. The conference met in Oct., 1645, and was opened in a spirit of moderation; but it soon lapsed into disputation and controversy, and at length broke up without any result, Nov. 21, 1645. The official account of the proceedings of the conference are printed in Calvi's *Historia Synergetica*.—See also Schröckh's *Kirchengeschichte seit der Reformation*, iv. p. 509.

THORN-APPLE. *Datura*, a genus of plants of the natural order *solanaceæ*, having a tubular 5-cleft calyx, a large funnel-shaped 5-lobed flower, a 2-laminated stigma, and an imperfectly 4-celled, prickly, or unarmed capsule. The species of this genus are annual herbaceous plants, rarely shrubs or trees; and are in general very narcotic, and productive of excitement or delirium. The common THORN-APPLE, or STRAMONIUM (*D. stramonium*), is an annual plant, with smooth stem and leaves, white flowers, and erect prickly capsules, a native of the East Indies, brought by the gypsies to Europe, where it is now very generally to be met with, as also in Asia, then, of Africa, and North America. It is by some stated to be the plant from which the poisonous "dri" of the gypsies is obtained. It contains a peculiar narcotic alkaloid, *D. daturine*, and is one of the most powerful narcotic acrid poisons; but its leaves and seeds are employed, although rarely, in medicine. The leaves have an extremely nauseous overpowering smell, and a loathsome bitter taste; the seeds, which are of a dark-brown color, are still more poisonous. A variety with pale violet flowers and purplish violet stem is frequently cultivated in gardens as an ornamental plant. Still more narcotic is the soft-haired thorn-apple (*D. metel*), a native of the s. of Asia and of Africa. Robbers in India employ it in order to stupefy those whom they would rob, or rather to throw them into the condition of a waking dream. From its seeds, along with opium, hemp, and certain spices, a strong

intoxicating substance is prepared, which the Mohammedans of India use in order to produce in themselves an indescribable joyfulness and extremely pleasurable feeling for a short time; but the use of it destroys the constitution. *D. tatula*, another Indian species, has similar properties, and is very energetic; as is also *D. sanguinea*, the Floribondo of Peru, which is used by the Indians to prepare a very powerful narcotic drink, which stuped when very diluted, and when strong, brings on maniacal excitement.—The beautiful *D. fastuosa* has flowers externally of a violet color, and white within, and is cultivated as an ornamental plant, especially a variety with what are called double flowers, which consist rather of two corollas, one within the other.—*D. arborea*, a native of Peru and Columbia, has begun to be also very generally cultivated in flower-gardens in Europe. It has very splendid pendulous white flowers, 9 by 12 in. long, which diffuse a sweet smell in the evening and at night.

THORNBACK, *Raja clavata*, a species of ray or skate, common on most parts of the British coast. It attains a large size; the muzzle is little produced, and the form is nearly rhombic; the tail has two small membranous fins near the tip, on the upper central ridge, and a small dilatation at the tip. The upper surface is brown, with lighter spots; the under surface white. The upper surface is rough with small points, and has numerous nail-like crooked spines, each with an oval bony base. The thornback is much esteemed for food, particularly in autumn and winter, but is most abundantly captured in spring and summer, when it approaches the to deposit its eggs.

THORNDIKE, GEORGE QUINCY. b. Boston, 1825; graduate of Harvard university, 1847; went abroad, studied art in Paris, and returned to reside in Newport, R. I. He has painted genre pictures, and landscapes; among them the "Lily Pond" at Newport, "Swans in Central Park," and "Wayside Inn."

THORNDIKE, ISRAEL, 1757-1832; b. Mass.; received a common education, and in 1776 was made capt. of the *Warren*, a privateer. He assisted in framing the Federal constitution, became a resident of Boston in 1810, and purchased and gave to Harvard university in 1818, the library of prof. Ebling of Hamburg.

THORNTON, EDWARD, b. England, 1810; entered the civil service of the East India company, retiring in 1860. Among his works on India are: *India, its State and Prospects* (1835); *History of the British Empire in India* (1841-45); *A Gazetteer of the Countries adjacent to India, on the North-west* (1844); and a *Gazetteer of India* (1854).

THORNTON, Sir EDWARD, b. England, 1820; educated for the diplomatic service, which he entered by appointment as attaché to the embassy at Turin in 1842. He filled the same position in Mexico (paid) in 1845, and was made secretary to the legation in that capital in 1851. During 1848 he did much to forward the conclusion of the important treaty of Guadalupe Hidalgo. In 1852 he was secretary of legation to Buenos Ayres; chargé d'affaires to Uruguay, 1854; minister to the Argentine republic in 1859; envoy to Brazil in 1865; and envoy to the United States in 1867. The latter position he still (1881) holds, though spoken of as the forthcoming British minister to St. Petersburg. He was a member of the commission on the Alabama claims in 1871; knighted Aug. 9, 1870.

THORNTON, JOHN WINGATE, b. Maine, 1818; graduated at the Harvard law school, 1840. Mr. Thornton has written a number of historical and biographical pamphlets and books, such as the lives of John Eliot, and John Bowles, *First Records of American Colonization*, etc. He was the founder of the New England historical and genealogical society.

THORNTON, MATTHEW, b. 1714-1803; b. Ireland, came to America in 1717, was educated at Worcester, Mass., and served as surgeon under William Pepperell in the capture of Louisburg, 1745. He settled as a physician in Londonderry, N. H., and was chosen president of the governmental convention in 1775. He became a delegate to the Continental congress, 1776, and signed the declaration of independence. He was afterward chief justice of Hillborough co., N. H., and later judge of the supreme court.

THORNWELL, JAMES HENLEY, D.D., LL.D., 1812-62; b. S. C.; graduated South Carolina college, Columbia, 1831; studied and taught; pastor of a Presbyterian church, Lancaster, S. C., 1835; professor of logic and belles-lettres in South Carolina college, 1838; pastor of Presbyterian church, Columbia, 1840; chaplain and professor of sacred literature and the evidences of Christianity in the college, 1841; pastor of Globe st. church, Charleston, 1851; president of South Carolina college, 1852; professor of didactic and polemic theology in the theological seminary, Columbia, 1855, and also pastor of the First Presbyterian church. He published *Arguments of Romanists Discussed and Refuted*; *Discourses on Truth*; *On the Rights and Duties of Masters*; *The State of the Country*. He published many controversial articles in the *Southern Presbyterian Review*, and defended slavery and secession. His complete works have been published by the rev. J. B. Adger. In the southern states he was esteemed as one of the greatest of preachers and theologians.

THORNYCROFT, MARY (FRANCIS), b. Norfolk, England, 1814; the daughter of John Francis, the sculptor. While still a child she began to acquire the art of modeling,

and her first attempts at sculpture were "Penelope" and "Ulysses and his Dog." Her first work of real value was the "Flower Girl." Others of her best works were "Sappho," "A Sleeping Child," and the "Skipping Girl," the best exhibited in the Paris exhibition of 1855. By queen Victoria, Mrs. Thornycroft was commissioned in 1843 to execute a statue of the princess Alice, and this proved so satisfactory that she was chosen also to model the princess royal, the prince of Wales, and prince Alfred. These four statues were designed in the characters of the four seasons, and added greatly to the artist's fame.

THOROUGH BASS. See FIGURED BASS.

THOROUGHWORT. See BONESET.

THORWALDSEN, BERTEL, one of the greatest of modern sculptors, was born, it is supposed, at Copenhagen, on Nov. 19, 1770. Neither the place nor the day of his birth, however, can be fixed with absolute certainty; and he himself, when casually questioned as to the last, replied with a certain *brusque* felicity: "I don't know; but I arrived at Rome on March 8, 1797;" dating his birth, as it were, from the commencement of his career as an artist. He was the son of a poor ship-carpenter, and his first essays in art were made in the carving of figure-heads in the yard where his father worked. His education was otherwise neglected, so that through life he could but indifferently write or spell; but the genius for art was born with him, and in 1793 he gained the first gold medal for design at the academy of Copenhagen; and along with it the privilege of three years' residence abroad for the purpose of study. Accordingly, in 1796 he sailed for Rome, arriving there as stated above. After long obscure and patient labor, his talent became conspicuous. From the celebrated Canova, in particular, he had early and generous recognition; and shortly, by the model for his great work, "Jason," he secured general admiration. No purchaser could, however, be found for it till, in 1803, just as in hopeless disgust the artist was about to return to Copenhagen, he received from the well-known Thomas Hope an order for its production in marble at a price which might be called munificent. From this time forward, prosperity and fame flowed upon him in full tide. In 1819 he returned to Denmark, taking the overland route, and everywhere on his journey special honor was paid him. His reception in Copenhagen was triumphal, and apartments were assigned him in the palace of Charlottenburg. He remained at home but a year, and at the end of it returned to Rome, where he continued to prosecute his art assiduously, up to 1838, when he left it, intending to pass his remaining years in his native country. Its climate, however, proved no longer suitable to him, and the year 1841 found him once more at Rome. In 1844, having revisited Copenhagen, he died suddenly there in the theater, of disease of the heart, Mar. 24. All the works remaining in his possession he bequeathed to his country, to be preserved in a museum bearing his name, for the maintenance of which he also left the bulk of his fortune, reserving a sufficient provision for Mme. Paulsen, his natural daughter. This magnificent and unique collection is now one of the chief glories of the metropolis of his native country. By his countrymen, he is naturally held in special honor; and their proud verdict, which ranks him the greatest of sculptors since Michael Angelo, is elsewhere more generally acquiesced in than is often the case in such instances of national enthusiasm. Anything like a catalogue of his chief works need not be here attempted. He addicted himself by preference to classical and mythological subjects; but his great works in the cathedral of Copenhagen, "Christ and the twelve Apostles," "St. John preaching in the Wilderness," and the "Procession to Golgotha," sufficiently prove that he was determined to this preference by no incapacity to appreciate and grandly fulfill the demands of the Christian ideal. Of the many busts from his hand of eminent contemporaries, those of Byron and the great Danish poet Cehlenschläger are perhaps the most notable. The life of Thorwaldsen has been written by Hans Christian Andersen, by J. M. Thiele, and by Eugene Plon. English readers may consult a careful abridgment of M. Thiele's work, by the rev. M. R. Barnard, published in 1855 by Messrs. Chapman & Hall, London; and a translation of M. Plon's *Life* by Mrs. Cashel Hoey, which appeared in 1874.

THOTH, also called **TAUT** or **THEUTH**, the Egyptian Hermes or Mercury, the mythical inventor of the arts and sciences, music and astronomy, and especially of speech and hieroglyphs or letters over which he was supposed to preside. His name, indeed, meant "speech," or "word," and he personified the divine logos, or intellectual power. See HERMES, EGYPT.

THOU, JACQUES AUGUSTE DE, or, as his name is frequently written, **Jacobus Augustus Thuanus**, son of Christophe de Thou, first president of the parlement de Paris, was born in that city, Oct. 8, 1553. He was originally designed for the church, but when old enough to judge for himself, he gave up all thoughts of an ecclesiastical career. In spite of the difficulty presented by a sickly constitution, he pursued both literary and scientific studies with vigor and success. Taking a liking for the writings of Cujacius, he took up his residence at Valence in Dauphiné where he attended the lectures of the celebrated jurist. At Valence, he made the acquaintance of Scaliger, with whom he maintained an unbroken friendship for the rest of his life. In 1578 he accepted, with reluctance, the office of ecclesiastical counselor of the parlement of Paris. A firm adherent of royalty, in 1588 he was made counselor of state to Henry III.; and during the rest of the reign of that king, he took a leading part in all public affairs. On the

accession of Henry IV., he was made keeper of the royal library. In 1593 he began his great work, the *Historia sui Temporis*, which principally occupied him during the remainder of his life. He took an important part in the arrangement of the edict of Nantes; but with this exception, he seems to have given but little attention to public affairs during the reign of Henry IV.; and the death of that monarch, in 1610 may be said completely to have ended his political existence. From 1604, when the first 18 books of the history appeared, the author held the position of first historian of his age. Eighty books appeared during his life; and the remainder, forming in all 138 books, were published in 1620, after the author's death, which took place May 7, 1617.

As a historian, Thou is eminently impartial; so devoid, indeed, did his work show him to be of religious prejudice, that he incurred the imputation of having no religion about which to feel; the consequence being that, in 1609, his work was put into the *Index Expurgatorius*—a fact which appears to have distressed him more than one would have expected. Written in Latin, the author has spared no pains to make it severely classical. It is generally held valuable rather from its workmanship than its material. The best English edition is that by Samuel Buckley, 7 vols. 1733. Thou also wrote a number of Latin poems.—See *Autobiography*, ending 1601; also Colinson, *Life of Thouanus* (Lond. 1807).

THOUROUT, a t. of Belgium, in the province of West Flanders, 11 m. w.s.w. of Bruges. There are manufactures of starch, mustard, hats, and wooden shoes. Thourout was a place of great commercial importance in the middle ages. Pop. '70, above 8,000.

THOUSAND ISLES, TIRE, probably the greatest collection of small islands in the world; numbering about 1800; situated in an expansion of the St. Lawrence river, between Ontario, Can., and Jefferson and St. Lawrence counties, N. Y. They have become a favorite resort for summer tourists and residents, on account of their picturesque beauty.

THRACE, anciently the name of an extensive country bounded on the n. by the Danube, on the e. by the Euxine, on the s. by the Ægean and Macedonia, and on the w. by Macedonia and Illyria. In prehistorical times, however, the name appears to have denoted the whole of eastern Europe n. of Greece, including both Macedonia and Scythia; so, at least, one is disposed to understand the fable, that Oceanus had four daughters—Asia, Libya, Europa, and Thracia. It is, on the whole, very mountainous—whence, perhaps, its name Thracia, from *tracheia*, rugged (?)—the principal range being Hæmus (mod. *Balkan*, q.v.), from which three lesser chains branch off in a south-easterly direction, the loftiest being Rhodope, the summits of which reach an elevation of more than 8,000 feet. The three most important rivers of Thracia are the Strymon (mod. *Stryma*), which, during the Greek period, formed the boundary between it and Macedonia; the Nestus (mod. *Carasu*); and the Hebrus (mod. *Maritza*, q.v.), the largest—all of which flow southward from Hæmus into the Ægean sea. Roughly speaking, ancient Thracia, before the rise of the Macedonian power, comprised the territory now divided by the Turks into the provinces of Rumili and Bulgaria; but subsequently the Romans made the range of Hæmus the northern limit of Thracia, and gave the region between Hæmus and the Danube the name of Mœsia (mod. *Bulgaria*). The climate was considered by the Greeks very severe—even that of Enos, on the shores of the Ægean, being described by Athenæus as “eight months of cold and four months of winter:” but it is believed that the ancient accounts are much exaggerated, or are only applied to Thracia poetically as the *north*, though it is not to be denied that, in the mountainous districts, the frost was often intense—as is still the case. The country was marshy, undrained, and overspread with dense damp forests (of fir, oak, chestnut, etc.), which must have considerably lowered the temperature; but large portions, especially in the s. and e., “such as the great plain of Adrianople and the land toward the lower course of the rivers Nestus and Hebrus,” were very fertile. The chief products were corn, millet, wine, and hemp. Cattle, sheep, horses, and swine were reared in great numbers. The region between the Nestus and the Strymon appears to have been infested by lions. Herodotus states that they attacked the baggage-camels of Xerxes on his march; but if this was anciently the case these formidable animals have long since disappeared. Gold and silver mines were numerous and productive in the same locality, and the acquisition of these was the principal motive for Philip of Macedon's aggressions.

The question has been much discussed, to what race the Thracians belonged, and it cannot be said that it has as yet been satisfactorily settled. It is certain, however, that two different peoples went by this name in early times. It is repeatedly asserted by those writers who treat of the confused medley of tradition and myth which fills up the prehistorical annals of Greece, that a race of “Thracians” inhabited part of the Hellenic peninsula, and had even at one time extended themselves as far as Attica. To these prehistoric Thracians belonged, says Strabo, the muses, and the cultivators of ancient music, Orpheus, Musæus, Thamyris, and Enmolpus; and the grand argument against confounding them with the Thracians of history is the impossibility of a race so notoriously barbarous as the latter in language and manners, having sprung from the authors of Hellenic literature and art (see Müller's *Hist. of Greek Lit.* p. 26, *et seq.*). But

whether the prehistoric Thracians were properly Hellenes, or "Pelasgians"—whatever that may mean—is indeterminable.

Passing now to the historic Thracians, whom we find settled in the regions n. and e. of Macedonia, we are again at fault. Of their manners and customs, of their character, and of their later history, we indeed know something; but of their origin and ethnological relations, we cannot be said to know anything. They were not Greeks, for they spoke a language which the latter called barbarous; but if (as Strabo asserts) the Getæ and Daci were branches of the Thracian family, and spoke the same tongue, we may conjecture that, ethnologically, the term "Thracian" denotes a mixed Illyrico-Scythian race; though it is quite impossible, from want of evidence, to substantiate the conjecture. Herodotus, Xenophon, and Strabo are our chief authorities regarding the habits and practices of the people. From them we learn that they bought their wives, and sold their children. Polygamy was general, and when a husband died, his favorite spouse was slain over his grave. Before marriage the Thracian women enjoyed the utmost liberty; after it they were guarded with Turkish rigor. War and robbery were the only honorable occupations of the men. They lived to steal, either from each other or from neighboring peoples. When not fighting or plundering they spent their days in savage idleness, or in quarreling over their cups. Courageous, or rather ferocious, after the fashion of barbarous peoples, they yet lacked the steady valor and endurance of disciplined troops; at all times, their warfare displayed more fierceness and impetuosity than fortitude. Their treachery was probably no greater than that of other barbarians.

The history of Thrace may be sketched in a few words. The Greeks first became acquainted with the inhabitants when they began to plant colonies on the coasts. Of these the principal were Byzantium (675 B.C.), Selymbria, Aldera (560 B.C.), Mesembria, Dicea, Maronea, Ænus, Cardia, Sestus, Amphipolis, etc.; but their want of union—the fatal weakness of Hellenic civilization—hindered them from acquiring that measure of power to which they might have otherwise aspired, and enabled the Thracian chiefs of the interior to preserve their independence. In 513 B.C., Darius, king of Persia, marched through Thrace on his way to punish the European Scythians, and on his return left Megabazus, with 60,000 men, to subdue the country. In this he partially succeeded, but new disturbances and complications arose between the Persians and Greeks, which resulted (480 B.C.) in the famous expedition of Xerxes, the details of which do not belong to Thracian history. We have only to mention that a consequence of the expulsion of the Persians from Europe was the resumption of liberty and the revival of prosperity among the Greek colonies in Thrace. Shortly before the Peloponnesian war, a native Thracian state—the Odrysian—had attained to great power and eminence under a ruler named Sitalces, who joined the Athenian alliance, but could not, in spite of his resources, prevent the triumph of Sparta in the north as well as in the south. The rise of the Macedonian kingdom, under Philip II. (359 B.C.), destroyed the independence of great part of Thrace. All the region between the Strymon and Nestus was incorporated with Macedonia, and Macedonian garrisons were established further east. Under the government of Lysimachus the subjugation of Thrace became complete. On the fall of the Macedonian kingdom (168 B.C.) it passed into the hands of the Romans, and subsequently shared the vicissitudes of the Roman empire. In 334 A.D. a colony of Sarmatians was planted in Thrace by Constantine, and in 376 another of Goths by permission of Valens. In 395 it was overrun by Alaric, and in 447 by Attila. In 1553 Amurath obtained possession of all its fortresses, except Constantinople, and it has ever since remained subject to Turkey. But see BULGARIA and ROUMELIA, EASTERN.

THRASHER, a name given in the United States to several species of thrushes. They have generally a rather long decurved bill, not notched near the tip; short concave wings, although in some the wings are longer than the tail. In others the wings are decidedly shorter. Color, brown or ash above, usually spotted on the breast. Their names are sage thrasher, or mountain mocker, *oreoscoptes montanus*; brown thrasher, *harporhynchus rufus*; cape St. Lucas thrasher, *H. cinereus*; gray curve-bill thrasher, *H. europhris*; California thrasher, *H. redivivus*; and red-vented thrasher, *H. crissalis*.

THRASIMENE, LAKE. See TRASIMENUS LACUS.

THRASYBULUS, d. B.C. 390; b. Athens, commanded an Athenian galley at Samos in 411. Attaching him self to the opponents of the oligarchy of 400, he was made gen., and secured the recall of Alcibiades. He won the battle of Cynossema, and in 407, in command of a fleet of 30 vessels compelled the submission of the revolted cities in Thrace. Banished by the 30 tyrants, he took possession, with the aid of a Theban force, of the fortress of Phyle. Occupying the Piræus with 1000 men, he fought the 30, and their successors the 10, and in 403 re-established the democracy. In 395 he commanded a force sent to relieve Thebes against the Spartans. In 390, with a fleet of 40 ships, he protected the Rhodians against Telentias. He was killed near Apendus, in Cilicia, by the inhabitants, in revenge for some outrage committed by some of his men.

THREAD is an exceedingly small twine made by doubling and twisting several thick-nesses of yarn so as to produce a strong and well-rounded line for sewing with, either of cotton, flax, or silk.

THREAD-WORMS. This term is employed by some zoologists to the whole order *nematoda*—a word derived from the Greek, and signifying a thread-like form. Most

writers, however, restrict it to the *oxyuride*, which, in the early part of this work, have been included in the *ascarides* (q.v.), but have been arranged in a separate family by Cobbold, who divides them into 10 genera. Only one species, *oxyuris vermicularis* (formerly known as *ascaris vermicularis*) (q.v.), the small thread-worm, infests man, and is the commonest of the intestinal parasites.

THREATS, in a legal sense, are that kind of intimidation which has for its object to influence a person in abandoning or surrendering some legal right, or what is equivalent, paying money, to prevent some injury being done to him. When the threats are made by more than two persons the offense usually assumes the form of conspiracy (q.v.). In other cases the usual form of the offense is the sending of a threatening letter—i.e. a letter either anonymous or otherwise—demanding money from the party addressed; otherwise, that he will be murdered, or his house will be burned, or he will be charged with some infamous crime. Whoever sends, or indirectly or directly, with knowledge of the contents, causes to be received, any letter or writing demanding, with menaces, or without any reasonable or probable cause, any property, chattel, money, valuable security, or other valuable thing, is held guilty of felony, and liable to penal servitude for life, or imprisonment for three years. And whoever demands such things with intent to steal the same, is also guilty of felony, with like punishment. So, whoever sends a letter threatening to accuse a person of any crime, with a view or intent to extort money or gain any valuable security or property, is guilty of felony. Whoever threatens to accuse one of an infamous crime, with intent to extort money, or gain some valuable property, is guilty of felony. Whoever sends a letter threatening to burn or destroy any house, barn, building, stack of grain or hay, or to kill or wound cattle, is guilty of felony.

THREE KINGS, FEAST OF THE, a famous mediæval festival, identical with Epiphany (q.v.) or twelfth night, and designed to commemorate the visit of the three magi or wise men of the east (transformed by the mingled ignorance and reverence of the middle ages into great kings) to the infant Savior. But the name is more particularly given to a kind of dramatic or spectacular representation of the incidents recorded in the 2d chapter of Matthew—as, the appearance of the wise men in splendid pomp at the court of Herod, the miraculous star, the manger at Bethlehem, the solemn and costly worship of the Babe—which was long very popular. In 1326 a peculiarly gorgeous representation was got up at Milan by the preaching friars. See Chambers's *Book of Days*, vol. i., page 62.

THREE RIVERS (Trois Rivières), seat of justice of St. Maurice co., Quebec, Can., on the St. Lawrence, at the mouth of the St. Maurice river, 80 m. n.e. of Montreal; having connection with the Grand Trunk railroad by means of a ferry to Doucett's; pop. '70, 8,414. Lumber is the principal business interest; there are large exports to the West Indies, South America, and England. It is noted for its manufacture of iron ware at the St. Maurice forges, 3 m. distant; brick making is also carried on. It was founded in 1618; contains a Roman Catholic cathedral, an Ursuline convent, an academy and hospital. It has a fire department, and is lighted with gas.

THRESHER. See FOX SHARK.

THRESHING is the separating of the grain or seeds of plants from the straw or halm, a process which has been accomplished in different ages and countries by means less or more effective. The first method known to have been practiced was the beating out of the grain from the ears with a stick. An improvement on this method was the practice of the ancient Egyptians and Israelites to spread out the loosened sheaves of grain on a circular piece of hard ground 50 to 100 ft. in diameter, and to drive oxen backward and forward over it, so as to tread the grain out; but as this mode was found to damage a portion of the grain, it was partially superseded in later times by the threshing-sledge (Egypt. *noreg*, cf. Heb. *morg*), a heavy frame mounted on three rollers, which was dragged over the heaps of sheaves. The use of the stick was, however, retained for threshing the lighter kinds of grain. Similar methods of threshing were employed by the Greeks and Romans, the stick (*fustis*, *baculum*, *pertica*), the treading by men or horses, and the threshing-sledge (*tribulum*) being found in common use among them; but their threshing-sledge, which is still to be seen in operation in Greece, Asia Minor, Georgia, and Syria, differed from the eastern one by having pieces of iron or sharp flints fastened to the lower side, in place of rollers. The primitive implement in northern Europe was the stick, and an improved modification of it, the *flail*, has not yet been completely superseded. The flail consists of two sticks loosely fastened together at one end by stout thongs (*caplins*), one stick (the *hand-staff*) is used as a handle by the workman, and by a circular swing round his head he brings down the other stick (the *scuple*) horizontally on the heads of the loosened sheaves spread out on the barn-floor. In the hands of a good workman this implement is found to perform its work pretty effectively, although slowly.

Various attempts were made to supersede the flail by a machine, but with little success, till 1787, when Andrew Meikle, an ingenious Scotch mechanic, produced a threshing-mill so perfect, that even after having run the gauntlet of nearly a century of improvers, it is essentially the machine of its original inventor. In Meikle's mill the

mode of operation is as follows: The sheaves are loosened and spread out one by one on the feeding-board, with the ears toward the machine; they are then pushed forward till caught between two revolving fluted rollers of cast-iron; and as soon as one sheaf disappears between the rollers, another is presented to them. Behind the rollers is a rapidly revolving *drum* or cylinder, having four *beaters* or spurs of wood armed with iron placed along its surface parallel to its axle; and these beaters striking the heads as they are protruded from between the rollers, detach the seeds and husks. Grain and straw then pass together over the cylinder, the former falling through wire-work, while the straw along its surface parallel to its axle; and being by them thoroughly tossed and separated from the grain and chaff, is then ejected. The grain which has fallen through the wire-work is received into a winnowing-machine, where it is cleansed from chaff, etc., and is then either discharged upon the barn-floor, or, as is the case with the most improved machines, is raised by a series of buckets fixed on an endless web, and again winnowed, to separate the perfect grains from the light and small seeds. Barley is, previous to the second winnowing, subjected to the process of "hummeling," by which the awns are removed; but the rest of the process is the same as above.

Since Meikle's invention, the improvements attempted on his mill have been chiefly confined to modifications of the drum; such as diminishing the distance between the drum and its cover; increasing the number of the beaters, and accelerating the speed of the drum.

The portable threshing-machine, now so generally employed in England and Scotland, has not the two grooved rollers, the loosened sheaf being at once submitted to the action of the threshing-machinery; the drum, which is a *high-speed drum*, is provided with six beaters, and its cover is capable of being set at any required distance from it by means of screws. A modification of this machine has the drum wide enough to allow of the straw being fed in sideways; the cover incloses the machine for about three-fifths of its circumference; and the straw, after separation from the grain, is delivered by the rakes almost unbroken, and in a condition fit for being at once put up in *bolts*, or bundles, whence this species of drum is called a *bolting-drum*. In another form, the drum is armed with rows of spikes projecting outward for about $2\frac{1}{2}$ in., which revolve between similar rows of spikes on the interior of the cover; this kind threshes effectually, but breaks and chops the straw much more than the other forms of drum.

The attention of inventors and manufacturers of threshing-machines has not only been turned of late to the question of securing increased speed, but also of providing against the risk of accidents to those employed about the mills. The feeding of those high-speed drums which were getting so common was attended with considerable danger. Within the last few years, however, mills have been constructed, and are working well, with patent self-feeding apparatus. Considerable protection to life seems to have thus been afforded. The self-feeding apparatus consists of a covered hopper containing a shaking-board on which the sheaves are thrown sideways. Through this board, iron spikes curved like a fork or rake move forward and seize the unthreshed grain. A second row of spikes regulates to a nicety the quantity of stuff reaching the drum at a time; and while the shaking-board is falling to let the grain come in contact with the drum, the first row of spikes progresses to catch a fresh supply. Some of the English threshing-machines fitted up in this way within the last few years thresh from 8 to 10 quarters of grain per hour, and perform their work in every respect satisfactorily.

The driving-power is wind, water, horse-power, or steam; the first of which is so very uncertain and unequal in its operation that it has nowadays been mostly superseded by the others. Water-power is always desirable, and when it can be had in sufficient quantity or regularity, it is much to be preferred in point of economy, its mode of application to threshing being either by the ordinary machinery of the water-wheel (q.v.) or by *Barker's mill* (q.v.). Horse-power was the agent in most common use in the earlier days of threshing-mills, the horses being yoked to beams attached to a vertical revolving shaft which communicated motion by means of beveled gear to the threshing-machine. But it was found that this kind of work was very trying for the horses, and interfered considerably with the other work of the farm; and accordingly steam-power, as being more economical, has extensively superseded horse-labor, engines of 4 to 10 horse-power being generally employed. Portable threshing-mills and engines are very generally employed in England, and to some extent in Scotland, being thought by many to be more economical, from their saving the labor of transporting the crop from the stack to the bar; and from their adaptability to the requirements of a farmer who may rent more than one holding in a district. On the other hand, however, some prefer the fixed machine on account of cheapness and diminished liability to derangement.

THRIFT *Armeria*, a genus of plants of the natural order *plumbaginæ*, having the flowers collected into a rounded head, a funnel-shaped dry and membranous calyx, five petals united at the base, five distinct styles, and five stamens attached to the base of the petals. By many botanists it has been regarded as a subdivision of the genus *statice*, from which it is distinguished chiefly by having the flowers in heads.—The common thrift (*A. maritima* or *vulgaris*) is a plant which grows in turf-like tufts, with linear leaves, scapes a few inches high, and beautiful rose-colored flowers, an ornament of the sea-coasts of Britain and of Europe generally, and also frequently found on high moun-

tains. It is often planted in gardens as an edging, for which is very suitable, being of a fresh green all the year, and exhibiting its fine flowers in profusion in July and August; but it requires to be renewed every two or three years, the smallest rootless sets growing, however, with great readiness in the moist weather of spring. The flowers are an active and useful diuretic. From two drams to an ounce of the flowers, freshly gathered and quickly dried, should be gently boiled, and the patient allowed to drink as much of the decoction as he pleases. Some aromatic, as anise or cinnamon, is added.

THRIPS, a genus of small insects of the order *hemiptera*, suborder *homoptera*, allied to *aphis* (q.v.), and included in the family *aphidæ* of some entomologists. The species are numerous and widely distributed. They are very active, and some of them very troublesome, by the injury which they do to cultivated plants, upon the juices of which they live. When disturbed, although they use their wings, their motion resembles leaping rather than flying. The wings are much fringed. A common British species is *T. cerealeum*, an insect not a line in length or in extent of wing, which resides in the spathe and husks of cereal grasses, particularly wheat and rye, in the beginning of summer, causing the grain to shrivel; and which, at an earlier season of the year, causes the abortion of the ear by puncturing the stems above the joints. It is most injurious to late-sown wheat, probably because the plants are weak, and therefore easily injured, at the time when the *thrips* abound. The larva is deep yellow, part of the head and two spots on the thorax dusky. The pupa is pale yellow and active. The perfect insect is flat, smooth, and pitch-color. The male is wingless, the female winged.

THROAT, AFFECTIONS OF THE. Common inflammatory sore throat has been already described in the article **QUINSY**; and other important throat diseases, aphthæ or thrush, and diphtheria, have also been discussed in special articles. The *malignant sore throat* of the older nosologists is now recognized as a modification of scarlatina. Another important variety of sore throat occurs as one of the forms of secondary syphilis. *Bronchocle* or *goutre*, which, to a certain degree, is an affection of the throat, is specially described under the latter name.

The disease popularly known as *clergyman's sore throat*, or *dysphonia clericorum*, and which is recognized in medicine under the name of *follicular inflammation of the pharynx*, first shows itself by huskiness of the voice, with more or less coughing, hawking, and expectorating, from an uneasy sensation in the throat; there is, moreover, a constant inclination to swallow. On examining the back of the throat, its mucous membrane is seen covered with granulation, caused by an accumulation of secretion in the follicles, which sometimes burst and discharge their contents, which are of an elastic consistent nature. This discharge is occasionally followed by ulceration. The disease commonly arises from too prolonged or powerful exercise of the voice by persons in whom the mucous membrane of the throat is in a relaxed condition. Perfect rest from public speaking, preaching, acting, etc., is of more importance than anything else in the way of treatment, and a residence during the winter and spring in a mild and equable climate is expedient. Torquay, Ventnor, Nice, Mentone, Algiers, and Egypt, afford a choice of suitable residences. Tonics, such as iron, quinia, and strychnia (in small doses not exceeding $\frac{2}{10}$ of a grain, three times a day), should be tried; but the local application of a strong solution of nitrate of silver (from 20 to 80 grains in one ounce of distilled water), applied by a probang to the affected mucous membrane, is usually of far more service than internal remedies. The best work on this subject is that of Dr. Horace Green, an American physician.

Passing over several throat affections of minor importance, we proceed to the consideration of wounds in the throat. These wounds are comparatively seldom the result of accident; they are more often made with a murderous intent, and most frequently they are made with the view of committing suicide.

The first duty of the surgeon, in treating a case of cut throat, is to arrest the flow of blood. Ligatures should be applied to the wounded arteries, and steady pressure with the finger (beneath which a small pad of lint is placed) to the wounded veins, such as the external jugular. If the internal jugular is wounded, fatal hemorrhage will very rapidly ensue, unless the wound is immediately plugged with small pieces of sponge, or pressure with the finger is maintained as long as necessary. With a knowledge of these means of checking hemorrhage by pressure, an intelligent non-professional person may be the means of saving life. When the bleeding has completely ceased, but not till then, means may be taken for bringing together the edges of the wound. In most cases, sutures, or even adhesive plaster, are inexpedient and even dangerous, and it is best to keep the parts in simple apposition. "The patient," says Mr. Gray, "should be placed in bed in a moderately warm room, the shoulders well raised by pillows, and the head bent forward and retained in that position by a bandage, and the wound should be covered with a strip of wet lint or linen."

THROCKMORTON, a co. in n.w. Texas, drained by the Brazos river and its branches; about 975 sq. m.; pop. '80, 711—700 of American birth. The surface is uneven. The soil is adapted to grazing. Co. seat, Throckmorton.

THROCKMORTON, Sir NICHOLAS, 1513-71, held household positions with the duke of Richmond and Henry VIII. He served at Boulogne and with Somerset in the Scottish wars, was knighted and returned to parliament from Northampton. He took the

side of Mary against lady Jane Grey, though himself a Protestant. In 1554 he was charged with complicity in Wyatt's rebellion and was acquitted, but detained in the Tower for a year. After his release he lived in France until the accession of Elizabeth, under whom he became chief butler of England and chamberlain of the exchequer. From 1559 to 1563 he was Cecil's ambassador to France. In the proposed marriage between Mary, queen of Scots, and the duke of Norfolk, he opposed the wishes of Elizabeth and lost her favor.

THROMBOSIS (derived from the Greek *thrombos*, a clot of blood) is a term originally suggested by Virchow, and was generally employed to designate an affection of the blood-vessel, (either veins or arteries) which essentially consists in a coagulation of blood (forming a true clot) at a certain fixed spot. Under certain morbid conditions, the blood has a tendency to coagulate in its vessels during life, on the least provocation. Thus, slight pressure on the side of the vein will sometimes induce this coagulation, while in other cases it is due to inflammation of the tissues which surround a vein, or laceration of a vein (as when the placenta is expelled from the uterus). A clot thus formed in a vessel increases and extends from one to another, till it reaches and finally fills a large vessel. Clots of this kind occurring in veins have been noticed from the times of Ambrose Paré and Petit, who seem to have been the first to apply the term *thrombus* to them.

THRON'DHJEM, or **TRONDHJEM** (Ger. *Drontheim*), the ancient Nidaros, and former capital of Norway, is situated in the Fjord of Thronthjem at the mouth of the little river Nid, 240 m. n. of Christiania; pop. '75 22,597. Thronthjem which consists of the old town, founded in 997, and the suburbs of Blakland and Ilen, is built on the picturesque and undulating slopes of the Nid Elv, and has regular and broad streets. The fortified islands of Munkholm and Christiansteen defend the capacious harbor, which is never closed by frost on the seaward side. Among the public buildings the most noteworthy are the Kongens-Gaard, or old palace, and St. Olaf's church, the remains of the old cathedral, now partially restored, built in the 12th century, by archbishop Oeysteen, who erected this noble Gothic pile on the site of the two early Christian churches which had been founded by Harald Haardrade and Olaf II. The fine western extremity of the nave was not completed till 1248. The body of the murdered St. Olaf was preserved within a costly shrine in the chancel of Christ church, which ranked as the metropolitan church of Norway, where the kings of Norway have been crowned since the time of Magnus V. (1164). Trondhjem is the seat of government for the province and of a bishopric, and has a public exchange, the principal national bank, a public library, museum, various literary and scientific institutions, an institution for the deaf and dumb, an insane asylum, etc. The chief articles of trade are fish, tar, deal, and copper, which is obtained from the neighboring mines of Røros. Salted cod and herrings, which are found in large quantities at the entrance of Thronthjem Fjord, are important articles of export. Besides its shipping and coasting trade Thronthjem is the center of considerable manufacturing activity, and has good sugar-refineries, distilleries, etc. The environs of Thronthjem are picturesque, and its position is one of considerable attraction, notwithstanding the high northern latitude (63° 25'); while the numerous historical events with which it is associated render it one of the most interesting towns in the Scandinavian kingdoms. The preponderance of wooden houses has somewhat diminished of late years, and the local authorities are endeavoring to enforce the use of stone for building purposes, in consequence of the frequent occurrence of great fires.

THRONE (Gr. *thronos*), the chair of royalty, an ornamented seat raised above the level of the floor, on which it stands, often covered with a canopy, and intended for the use of a sovereign or other potentate. From an early period the Asiatic monarchs are represented as enthroned; the same usage of a dignified chair set apart for the sovereigns was adopted in Greece, where also it was customary to represent all the greater gods, as enthroned. In the middle ages and modern times, the throne has been in all monarchical countries the chair occupied by the sovereign on state occasions. The name of throne was also given, in the early centuries of the Christian church, to the raised seat in the middle of the tribune behind the altar, where the bishop sat surrounded by his clergy. The throne is now a common metaphorical expression for sovereign power and dignity.

THROSTLE. See **SPINNING**.

THROW, the term applied in mining to the amount of dislocation (q.v.) in a vertical direction, produced by a fault in the strata.

THRUSH, *Turdus* or *Merula*, a genus of birds of the family *merulidæ* or *turdidæ*, having a bill of moderate size, straight, the upper mandible convex, its point compressed, notched, and slightly curved downward, the gape furnished with a few hairs; the nostrils near the base of the bill, oval, partly closed by a naked membrane; the first feather of the wing very short, the third and fourth longest; the tarsus longer than the middle toe, the outer toe connected with the middle toe at the base. The species are numerous and widely distributed, some of them inhabiting temperate and even cold countries, and some found only in tropical regions. Some of them are birds of passage, as the fieldfare and redwing. Some are gregarious, particularly in winter, as the species

just named; others live solitary or in pairs. The common British species are the blackbird (q.v.), fieldfare (q.v.), redwing (q.v.), ring ousel (q.v.), song thrush, and missel thrush.—The SONG THRUSH, or THROSTLE (*T. musicus* or *M. musica*), the mavis of the Scotch, is smaller than the blackbird, its whole length being not quite nine inches. Its plumage is brown, of various finely-mingled shades; the throat, sides of the neck, breast, and flanks yellowish, spotted with dark brown; the belly nearly white, with a few spots of dark brown; a dark brown streak, with a lighter brown streak over it, passing from the bill to the eye. It is found in all parts of Europe, but deserts some of the northern parts in winter, being thus partially a bird of passage. It remains all the year in Britain. It feeds on insects, worms, slugs, snails, berries, and seeds. It often makes its nest in the center of a thick bush or shrub, and sometimes in an open shed. The eggs are usually four or five in number. The male takes part in the work of incubation, and is very attentive in feeding his mate while so occupied. The throistle is well known as one of the sweetest songsters of the groves. In captivity, it has been taught simple airs.—The MISSEL THRUSH (*T. viscivorus* or *M. viscivora*) is about 11 in. in entire length, and is the largest and strongest European species of the genus. The plumage is very similar to that of the song thrush. The tail is slightly forked, which is not the case in that species. The spots on the belly are more numerous and black. The song is loud and clear, but not equal to that of the song thrush or of the blackbird. The bird delights in pouring forth its song from the very top of a tall tree. It also very often sings before or during wind and rain, whence it has received the name of stormcock. Its nest is generally fixed in the fork of a tree. It is found in almost all parts of Britain where there are woods. Its range extends through great part of Asia; it is found in India.—The WOOD THRUSH (*T. mustelinus* or *M. mustelina*) is abundant in North America in summer, as far n. as Hudson's Bay, retiring to tropical and subtropical regions in winter. It is rather smaller than the song thrush and very similar to it. It is of a very shy and retiring disposition. It has a clear but very simple song, which is to be heard in the depths of the forest, far from the haunts of men. Several other species are found in North America. India has some. A common West India species (*T.* or *M. leucogenys*) is familiarly known by the name of hopping Dick, and is a general favorite from its bold lively manners, and its sweet song. All the species are in esteem for the table, and the song thrush is much sought for this use in Italy in the season of ripe grapes, when it becomes very fat. Gardeners in Britain well know how troublesome thrushes are where numerous, from their avidity for cherries and small fruit.

THRUSH, known also as *infantile sore mouth*, is essentially a disease of early infancy, although it may occur at any age. Its characteristic symptom is the presence of small roundish white specks or patches on the lining membrane of the cavity of the mouth and throat, on the surface of the tongue, the angles of the lips, etc. These patches, which are termed *aphthæ*, look like minute drops of tallow or fragments of curd, and are formed by elevated portions of epithelium covering a drop of serous fluid; and as the dead epithelium falls off, a raw surface, or a dirty ash-colored spot, is left exposed. In thrush, crops of these little patches commonly succeed one another. These spots render the mouth hot and tender, in consequence of which the act of sucking is accompanied by difficulty and pain. In association with these local symptoms are indications of general constitutional disturbance, such as feverishness, drowsiness, sickness, flatulence, colicky pains, diarrhoea, etc. The stools are green and slimy, and not unfrequently acrid, as may be inferred from redness of the anus being a common symptom. The vomited matters are also green, and have a strongly acid smell, as also has the breath. The complaint sometimes seems to be the result of improper diet, if the child is being brought up by hand, or of unwholesome milk from a diseased or intemperate nurse; of bad ventilation, etc.; but in some cases the cause of the disease is not evident. The disorder usually lasts eight or ten days, and is only attended with danger when the local affection runs into a low form of gangrenous ulceration. As undue acidity of the stomach seems to be an almost general symptom, the diet should be carefully regulated, and mild *antacids* prescribed. Dr. (now sir Thomas) Watson specially recommends a mixture of 2 parts of dried carbonate of soda and 1 of gray powder (mercury with chalk), of which from three to five grains may be given thrice daily. As a local application to the patches, honey of borax may be applied with a camel-hair pencil; or a pinch of a mixture of powdered borax and loaf-sugar (1 to 8 or 10) may be placed occasionally on the tongue, and the infant allowed to spread it over the mouth.

THRUSH, or **TRUSH**, in the horse, consists in inflammation and ulceration of the sensitive surfaces within the frog, giving rise to a fetid discharge, constituting unsoundness, and usually causing lameness. Want of cleanliness is the chief cause. Daily, when the horse returns to his stable, the foot should be washed out with soap and water, carefully dried, and the fissures filled with mineral tar. If amendment does not speedily ensue, a dressing of calomel should be substituted for the tar several times a week. Ragged or loose portions of the frog may be removed by the knife or scissors.

THUCYD IDÉS, the great historian of the Peloponnesian war, born of the demus Halimus, most probably in 471 B.C., is said to have been the son of Olorus and Hegesipyle, and connected with the family of Cimon. It is stated—on authority equally conjectural, however—that he was instructed in oratory by Antiphon, and in philosophy by

Anaxagoras. Certain it is that, Athenian as he was, of good family, and resident in the most cultivated community in Greece, he must have enjoyed a most liberal education. He was further possessed, either by inheritance or by acquisition through marriage, of gold mines in that part of Thrace lying opposite the island of Thasos. He left a son called Timotheus, and perhaps also a daughter, who is said by some scholars to have written the eighth book of his history. We know from himself that he was one of the sufferers from the terrible plague of Athens, and also one of the few who recovered. We have no direct evidence as to his having displayed in public the oratorical talent which he reveals in his history; but it is certain that he held military command, and that he had under him an Athenian squadron of seven ships at Thasos, 424 B.C., when Eucles, who commanded in Amphipolis, solicited his assistance against Brasidas. The expected arrival of a superior force induced Brasidas to offer Amphipolis favorable terms, which were accepted. Thucydides arrived on the evening of the same day on which Amphipolis had surrendered; and though he prevented Eion, at the mouth of the Strymon, from falling into the enemy's hands, still his failure to save Amphipolis caused him to be sent into exile, probably to avoid the severer punishment which his enemy Cleon, then so popular with the Athenians, was designing for him. Where his exile was spent, is not known. Probably he lived a good deal in the Peloponnesus, if not also in Sicily, as has been inferred from his minute descriptions of Syracuse and its neighborhood. According to his own account, he lived in exile twenty years, and probably returned to Athens about the time when Thrasylbulus liberated it, in the beginning of 403. Ancient authorities are all agreed that his end was a violent one, though whether it occurred at Athens or in Thrace, we have no means of ascertaining. The year of his death is generally fixed at 401. Uncertainty also prevails as to the time when he wrote his history. He is supposed, from hints supplied by himself, to have kept a register of the events of the war, from its outbreak to its close. His great work, chronologically divided into winters and summers—each summer and winter making a year—was subsequently rearranged, probably by Alexandrine critics, into the books and chapters as we now have it; and of these books the eighth (and last) is supposed either to have not been written by him, or to have not received the same careful revision which he bestowed on the previous seven. There is hardly a literary production of which posterity has entertained a more uniformly favorable estimate than the history of Thucydides. This high distinction he owes to his undeviating fidelity and impartiality as a narrator; to the masterly brevity of his style, in which he is content to give in a few simple yet vivid expressions the facts which it must have often taken him weeks or even months to collect, sift, and decide upon; to the sagacity of his political and moral observations, in which he shows the keenest insight into the springs of human action, and the mental nature of man; and to the unrivaled descriptive power exemplified in his account of the plague of Athens, and of the Athenian expedition to Sicily. Often, indeed, does the modern student of Greek history share the wish of Grote, that the great writer had been a little more communicative on collateral topics, and that some of his sentences had been expanded into paragraphs, and some of his paragraphs into chapters. But this want cannot have been felt by the contemporaries of Thucydides; while the fate of other ancient historians warns us that had his work, like theirs, been looser in texture, or less severely perfect, it would not have survived, as it has done, the wearing influence of time, or remained, in its own language, the *tema es æci*—the “possession forever”—it has proved to the world. The best editions are those of Poppo (11 vols. Lps. 1821–40), of Krüger (2 vols. Berl. 1846–47), and—at least for historical illustration—of Arnold (3 vols. Oxford, 1830–35). The best English translation is by Richard Crawley (1874); that of the rev. Thomas Dale is also good.

THUG (from the Hindustani *thaga*, deceive; hence, literally, a deceiver, a cheat) is the name of a religious fraternity in India, which, professedly in honor of the goddess Kâli, the wife of Siva, is addicted to the committal of murders, and chiefly lives upon the plunder obtained from its victims. The name of Thugs is that by which this fraternity is generally known among Europeans in the more northern parts of India. In some provinces to the southward they are called *Phansgars*, or “stranglers” (from the Hindustani *phansi*, a “noose”). In the Tamil language their name is *Ari Tulukar*, or “noosers;” in the Canarese, *Tanti Kalleru*, or “thieves who use a cat-gut noose;” and in Telugu, *Varlu Vandla*, or “people who use the noose.” In the s. of India they used to live under the protection of the native chieftains, who, on the consideration of a settled contribution, and probably also of a share in the result of their depredations, connived at their practices, which, to the uninitiated, were generally concealed under the guise of an honest industry, especially that of the culture of land.

The proceedings of the Thugs are generally these: Banding together in gangs of from 10 to 50, but sometimes also of a much greater number, they assume the appearance of ordinary traders, traveling, if enabled to do so by their wealth, on horseback, with tents, and all the comforts of opulent merchants; but if this be not possible, also in more humble characters. Each gang has its *jenadar*, or leader; its *guru*, or teacher; its *sothas*, or entrappers; its *bluittotes*, or stranglers; and its *tughaes*, or grave-diggers. On arriving at towns and villages, they pretend to meet by accident, and to have no previous acquaintance with one another. Some of the gang are then employed as emis

saries to collect information; and when learning that any persons of property are about to undertake a journey, they endeavor to insinuate themselves into their confidence, and usually propose to them, under the plea of safety, or for the sake of society, to travel in their company; or else they follow them, waiting for the proper opportunity of carrying out their murderous work. The latter is generally perpetrated by throwing round the neck of the victim a rope or cloth, which one of the gang holds at one end, while the other end is seized by an accomplice; and while the two Thugs draw the noose tight, and press the head of their victim forward, a third seizes him by the leg, thus causing him to fall to the ground. The fatal injury is then easily inflicted. Travelers staying in the same choultry, or public resting-place, are sometimes murdered in the night. In attacking a traveler on horseback, generally one of the gang goes in front of the horse, while another keeps himself in the rear; a third, walking by his side, when finding him off his guard, suddenly seizes him by the arm, and drags him to the ground: the sufferer is then strangled in the usual manner. Three Thugs are therefore generally required to murder one man; two, at the least, are thought necessary; for to strangle a man single-handed is a rare occurrence, and a feat of this kind is esteemed by the fraternity a most honorable distinction, which goes far to ennoble, in the eyes of his fellows, the Thug who has accomplished it, and even his family, for many generations. After the murder is perpetrated the body of the victim is generally mutilated, in order, it seems, to expedite its decomposition, and thus to guard against discovery. For the same reason, care is taken to inter the body at a spot where it is not likely to be found; and thus it could happen that entire parties of travelers were destroyed, and not a vestige of them was discoverable. The indiscriminate slaughter in which the Thugs seem to indulge, is to a certain extent restrained by superstition; thus, it is deemed unlucky to kill certain classes and castes; and, as a rule, the female sex is exempt altogether.

The mode of dividing the plunder is probably various. According to one account, "a portion of it is usually appropriated to defraying the expenses of religious ceremonies; and sometimes a part was also allotted for the benefit of widows and families of deceased members of the gang. The residue of the booty being divided into several parts, was generally shared as follows: To the leader, two shares; to the men actually concerned in perpetrating the murder, and to the person who cut the dead body, each one share and a half; and to the remainder of the gang, each one share."

The practice of Thugs is not restricted to adventures on land. The rivers of India also are infested by bands of these robbers, who have similar habits to those of the land Thugs. They generally go in considerable parties—the one assuming the dress of travelers of respectability, the others acting as boatmen. When going up the river, they always pretend to be men going on pilgrimage to Benares, Allahabad, or some other sacred place; when going down, they pretend to be on their way home from such places. The travelers intended for their victims are inveigled on the high-roads, and murdered inside the boat, while some of the gang above sing and play. At a signal given by these that all is clear, the bodies of the murdered men are thrown into the river.

The patron goddess of the Thugs is *Devī* or *Kālī*, the wife of the god *Śiva*, and the deity of destruction. In her name they exercise their profession, and to her they ascribe its origin. Formerly, they believe, *Kālī* co-operated with the Thugs; and assisted them in the disposing of the bodies of their victims by devouring them. But through an indiscretion of one of the fraternity, who, out of curiosity, pried into the proceedings of the goddess, she became displeased, and condemned them in future to bury their victims. But though she now refused her future assistance, she presented her worshipers with one of her teeth for a pickaxe, a rib for a knife, and the hem of her lower garment for a noose. Whether on the faith of this legend or otherwise, it is certain that the pickaxe is the instrument which, by all the Thugs, is held in the highest estimation. Its fabrication is superintended with the greatest care, and it is consecrated to its duties under many and minutely regulated ceremonies; and after it has thus been prepared, it is only intrusted to a Thug selected for this dignity on account of his shrewdness, caution, and sobriety. The place where, and the manner in which, it is then deposited are likewise the subject of the strictest rules; and it is submitted to special purifications after each time that it has been used for the preparation of a grave. The pickaxe is, in short, looked upon with the highest reverence by a Thug; it is the symbol of his faith, and the chief object of his superstitions. That these superstitions are gross and numerous may be easily anticipated. The belief in omens, especially, plays a great part in a Thug's career. All his movements are regulated by it, and the learning of the Thugs consists in a thorough acquaintance with them.

To a neglect of the warnings given by omens, or to an imperfect acquaintance with them, the Thugs invariably ascribe a failure of their undertakings, if it happens. When preparing for an expedition the auspices are always solemnly taken; and only if favorable it is carried out. Among the bad omens they count the meeting the corpse of any one belonging to the village, the meeting an oil-vendor, a carpenter, a potter, a dancing-master, a lame or blind man, a faker with a brown waistband, or a Hindu devotee with long traced hair. To sneeze is a bad thing at setting out on an expedition; to meet a woman with an empty pitcher, or an ass braying from the front, a pair of jackals crossing the road in front of the gang, to see a wolf cross the path from left to right. On the other hand, it is a lucky omen to meet a woman with a pitcher full of water, or a preg-

nant woman, or to hear an ass braying on the left while halting at a stage, or to see a single jackal passing from right to left, or an antelope from left to right. Superstitions like these—and it is not necessary to give more instances of them—sufficiently show that the Thugs consider their murderous practices as countenanced and regulated by higher powers; and it is for the same reason that after every murder they perform a special solemnity called *tapunt*. It is celebrated in honor of the terrific Kālī, and its principal feature consists in addressing a prayer to the goddess, and in making the practical stranglers, those who formed part of the expedition, and committed the murders, partake of *gaur*, or consecrated sugar, the effect of which is believed to be irresistible. Other ceremonies are, of course, likewise performed on the occasion; but it is from the eating of the gaur that the strength and prosperity of the Thug are supposed necessarily to be derived. Another feast observed by the Thugs throughout India is called *Kurhæ Kârna* or *Kotz*. It likewise takes place in honor of Kālī, and the requisites for its celebration are goats, rice, ghee (butter), spices, and spirits. The superstitions of the Thugs are all of Hindu origin; but they are adopted also by the Mohammedans, who, while stout adherents to the tenets of the Koran, yet pay due honors to the Hindu goddess of destruction. This inconsistency they sometimes reconcile by identifying Kālī, whose other name is also Bhavāni, with Fatima, the daughter of Mohammed, and wife of Ali, and by saying that Fatima invented the use of the noose to strangle the great demon Rukutbeejana.

At various periods steps were taken by the native and English governments to suppress Thuggee—the practice of the Thugs—but it is only since 1831 that energetic measures were adopted by the British authorities to counteract the evil; and though it has not yet altogether disappeared, it may be safely assumed that it is fast dying out.—For a fuller account of the Thugs the reader is referred to the *Illustrations of the History and Practices of the Thugs* (by E. Thornton, Lond., 1837)—whence the foregoing outline is taken; to the authentic reports of special cases contained in the same work; and to col. Meadows Taylor's *Confessions of a Thug* (1840).

THUJA. See **ARBOR VITÆ.**

THULE, the name generally given by the ancients to the most northerly part of Europe known to them, and in the description of which fancy played a conspicuous part. According to Pliny, it was an island in the northern ocean, discovered by the navigator Pytheas, who reached it after six days' sail from the Oræades. The name Thule appears to be merely a classic form of the Gothic *Tiel* or *Tiule* "remotest land" (comp. Gr. *telos*, a goal); and most modern geographers identify Thule with Iceland. Some, however, prefer to seek for it in that part of Norway called *Thule* or *Thulemark*, or in Jutland, the extremity of which is known as *Thy* or *Thyland*. Ptolemy considers that Mainland, the principal member of the Shetland group, has the best claim to being regarded as the Thule of Pytheas.

THUMB IKINS, or **THUMBSREW**, an instrument of torture for compressing the thumb, largely made use of by the Inquisition in Spain, and also occasionally used in England when examination by torture was practiced there. The last instance of its application in Britain was in the case of principal Carstairs, on whom this mode of torture was inflicted for an hour and half at Holyrood by the Scottish privy council, with the view of obtaining from him confession of the secrets of the Argyll and Monmouth parties, but without effect in producing any disclosures.

THUN, a picturesque and ancient t. of Switzerland, in the canton of Bern, 17 m. s.e. of the city of that name. It stands on the Aar, 1 m. from the lake of Thun, out of which the river rushes past the town in a stream of crystal clearness. The old castle of the 12th c. with its corner towers, and the venerable church, are the chief buildings. Thun is the starting-place for those who visit the Bernese Oberland, and is consequently visited by crowds every season. Pop. '70, 4,623.

THUN, LAKE OF, in the canton of Bern, Switzerland, between the t. of Interlaken on the e., and that of Thun on the n.w.; is 12 m. long, 2 m. broad, about 1800 ft. above sea-level, and in some places between 600 and 700 ft. deep. The scenery is very attractive. Steamers ply on the lake, and there is a good post-road along the s. shore.

THUNBERG, CARL PETER, 1743–1828: b. Sweden; studied with Linnæus at Upsal; sailed with a Dutch ship as surgeon, 1771–73, cruising at the cape of Good Hope; lived 6 years in Java and Japan, returning in 1779 to Sweden, where he was appointed successor to Linnæus in 1784 as professor of botany at the university of Upsal.

THUNDER. See **LIGHTNING.**

THUNDERBOLT, in heraldry, a bearing borrowed from classical mythology, which may be described as a twisted bar in pale inflamed at each end, surmounting two jagged darts in saltire between two wings displayed with streams of fire.

THURGAU (i.e., valley of the Thur), a frontier canton in the n.e. of Switzerland bounded on the n.e. by the lake of Constance, and on the w. and s. by the cantons of Zürich and St. Gall. Area, 394 sq. m.; pop. '77, 95,390. The surface, unlike that of the other cantons of the country, is undulating or hilly, but nowhere mountainous, the chief height being the Hörnli in the extreme s., 3,690 feet. The principal river is the

Thur, from which the canton derives its name, and from which, flowing w.n.w. through a broad valley, joins the Rhine in the canton of Zürich. The soil is fertile in the ordinary crops, and remarkably so in fruits—large tracts of open country being laid out in orchards, as well as vineyards. Three-fourths of the inhabitants are Protestants. Capital, Frauenfeld.

THURIFER (Lat. *thur*, incense, and *fer.*, to carry), the ministering attendant in the Roman Catholic church, at solemn mass, vespers, and other solemn ceremonies, whose duty it is to carry the *thurible*, or incense vessel, and either to minister incense (q.v.) himself, or to present the thurible to be used for that purpose by the officiating priest. The office of thurifer is one of those which belong to the so-called "Minor Order" of *acolyte*. See **ORDERS**. The thurible now in use, consists of a metallic vessel for holding burning charcoal, commonly of silver or silver-plated, but occasionally also of gold, with a movable cap, and suspended from four chains, so as to be capable of being freely waved about in the air for the readier dispersion of the smoke of the incense, which is thrown upon the live charcoal.

THÜRINGER-WALD (Forest of Thuringia) is a considerable mountain-range of central Germany, which extends from the junction of the rivers Werra and Horsel, near Eisenach (q.v.), in a s.e. direction to the n. of Bavaria, where it joins the Frankenwald a ramification of the Fichtel-Gelbirge. Its total length is about 50 m., and its highest summits (Gross-Beerberg, Schneekopf, Inselberg, and Finsterberg) range from a height of close on 3,000 ft. to about 3,200 feet. The range is composed mostly of granite, porphyry, and argillaceous schists, abounding in metallic veins, among which iron ore is most conspicuous, though many others are found more or less plentiful; and auriferous sands occur in some of the rivers which have their source here. The Thuringerwald is parcelled out amongst the states of Weimar, Meiningen, Coburg-Gotha, Prussia, Schwarzburg, Reuss, and Altenburg.

THURINGIA (Ger. *Thüringen*), the name still borne by that part of upper Saxony which is generally bounded by the Werra, the Saale, and the Harz mountains, though it has no longer any distinct terminal significance. The country was so-called from the people Thuringii (probably the descendants of the Hermunduri), who were found inhabiting it in the 5th century.

THURLES, a market-t. and seat of a poor-law union in the county of Tipperary, province of Munster, Ireland. It is a place of great antiquity, and is celebrated not only in the bardic history, but also as the scene of a great battle with the Danes. It is situated on the river Suir, 53° 42' n. lat., 7° 47' w. long., 86 m. s.w. from Dublin, with which city, as well as with Cork, it is connected with the Great Southern and Western railway. Pop. of township '71, 5,008, of whom 4,873 were Roman Catholics. Thurles being the seat of the Roman Catholic archbishop, has two convents of nuns, a monastery of Christian brothers, and a college for ecclesiastical and general education, numerously attended.

THURLOW, EDWARD, Lord, an English lawyer, was born in 1732, at Little Bracon-Ash, in Norfolk. His father, a clergyman, sent him to school at Canterbury, where he obtained a sound knowledge of the Latin and Greek classics. Thence he proceeded to Cambridge, but in his zeal, it is said, to affect the character of an idle clever boy, he committed breaches of discipline which compelled him to leave the university. He became a student of the Inner Temple, and was called to the bar in 1754. He was a fellow-pupil, in a solicitor's office, with the poet Cowper, and still affected idleness, although, in reality, he worked hard to make himself a good lawyer. His lofty stature, strongly marked features, dark eyes, bushy eyebrows, and look of self-possession and wisdom, led, it appears, every one with whom he came in contact to attribute to him qualifications he really did not possess. His gifts, however, were those most likely to insure early success at the bar. An accidental meeting, at a coffee-house, with the Scotch solicitors in the great Douglas case, led to his employment in it as junior counsel, and to his acquaintance with the members of the Douglas family. It was one of them, the duchess of Queensberry, who, by her influence with lord Bute, obtained for him, in 1761, the rank of king's counsel. After this period, he acquired a still higher reputation by his speech in the Douglas case—the greatest effort of his life. In 1768, he was returned from Tamworth, and became a zealous supporter of lord North. When, in 1771, he was appointed solicitor-general, he attracted the especial notice of George III. by the zeal he displayed in supporting the American policy of the government. In 1778, he was raised to the woolsack; and such was his influence with the king, that he was allowed, contrary to all precedent, to retain the office under the Rockingham administration. He caused great embarrassment by opposing all the measures brought in by that government. Under the coalition ministry, he was compelled to retire; but he was restored as chancellor on Mr. Pitt coming to power. For a time he supported the government; but relying again on the support of the king, he once more began to give trouble, and ventured to oppose the measures his colleagues brought forward. Pitt then intimated that he or Thurlow must retire, and the king, without any hesitation, consented to his removal (1792). Thurlow

sank into comparative obscurity. He amused himself in reading the Latin and Greek classics with his nephews, and spent much of his time in visiting and receiving visits. He died at Brighton on Sept. 12, 1806. Lord Campbell, in his excellent life of Thurlow, says he can find nothing recorded of him to justify the great reputation for ability he had among his contemporaries, and ascribes it chiefly to his assuming manner; but it must be recollected that he had no Boswell to record his talk, and that it was his conversation which was admired. Johnson would not have said of an ordinary person as he did of him. "I would prepare myself for no man in England but lord Thurlow. When I am to meet him, I should wish to know a day before."

THURMAN, ALLEN G., b. Va., 1813; removed to Ohio while still a child, and received there an ordinary school education, but was well grounded in the French language by a Paris professor who lived in his family. He fitted himself for the bar, and was admitted in 1835 to practice; represented Ohio in the 20th congress; was judge of the supreme court of that state in 1851, and in 1854 chief-justice. In 1869 he was elected to the U. S. senate to fill the unexpired term of Benj. F. Wade; and was re-elected in 1874. He retired from the senate March 3, 1881, after 12 years continuous service, with a high reputation for statesmanship and integrity. His views on finance were toward the expansion of the circulating medium, but in general politics he has been profoundly democratic. He has been a prominent candidate for the democratic nomination for president.

THURSDAY (Swed. *Thorsdag*, Ger. *Donnerstag*), the fifth day of the week, is so called from Donar or Thor (q.v.), who, as god of the air, had much in common with the Roman Jupiter, to whom the same day was dedicated (Lat. *Jovis dies*, Fr. *Jendredi*).

THURSO, a burgh of barony, sea-port, and market-town on the n. coast of Caithness, 20 m. n.w. of Wick. It is irregularly built, but contains some handsome freestone houses, and two handsome churches. Thurso castle, to the east of the town, is a fine venerable structure. The harbor is a safe one for vessels not over 150 tons burden. At Scrabster, on the w. side of the bay, steamers call regularly, and there is a good roadstead with a pier. Ropes are manufactured; and cattle, grain, sheep, and paving-stones exported. A railway connecting Wick and Thurso with the south was completed in 1874. Pop. '71, 3,604.

THURSTON, a co. in s.w. Washington territory; bounded n.e. by the Nisqually river; drained by the Des Chutes river; crossed by the Pacific division of the Northern Pacific railroad; about 675 sq.m.; pop. '80, 3,270—2,748 of American birth. The surface is generally mountainous. The soil near the rivers is fertile. The principal productions are corn, wheat, oats, wool, and grass. Co. seat, Olympia.

THURSTON, ROBERT HENRY, b. R. I., 1839; educated at Brown university. In 1861 he was appointed to the engineers in the navy. He served through the rebellion, and in 1865 became assistant prof. of natural philosophy and lecturer on physics and chemistry, at the U. S. naval academy. After making a study in England of the iron manufactures, he was called in 1871 to the chair of mechanical engineering at the Stevens institute of technology, Hoboken, N. J. In 1873 he went to Vienna as a member of the U. S. scientific commission. He was on the international jury of the exhibition, and published a report on *Machinery and Manufactures*. In 1875 he served on the U. S. commission on the causes of boiler explosions. Among his inventions are the magnesium-ribbon lamp, and an improved steam-engine governor. He has published many scientific papers of high value.

THWARTS, in a boat, are the cross-benches on which the rowers sit.

THYLACINE, *Thylacinus*, a genus of carnivorous marsupial quadrupeds, nearly allied to opossums and dasyures. The muzzle is elongated, and somewhat dog-like. The tail is long and tapering. Only one species is known (*T. cynocephalus* or *Harrisii*), a native of the mountainous parts of Van Diemen's Land, where it inhabits the wildest glens, but issues from them to prey on the sheep of the colonists, by whom it is commonly called the wolf, or tiger-wolf, and is destroyed by all possible means. Kangaroos, echidnæ, etc., seem to have been its ordinary prey before sheep were introduced. It is the size of a large dog, and is the most powerful of Australian carnivorous quadrupeds. It is very active and fierce. It is not known to exist except in Van Diemen's Land.

THYME, *Thymus*, a genus of humble half-shrubby plants, of the natural order *abiata*, having a two-lipped calyx, and four diverging stamens. **GARDEN T.** (*T. vulgaris*) is 6—10 in. high, with narrow, almost linear leaves, and whitish or reddish flowers, which grow in separate whorls, six in a whorl. It is common upon dry hills in the s. of Europe, and is very commonly cultivated in gardens, on account of its fragrance.—**WILD T.** (*T. serpyllum*) has a procumbent stem with many branches, 2—3 ft. long, oval leaves and purplish flowers, arranged in whorls, which are united in a head. It is abundant on hills and mountains in Britain, and in all parts of Europe; and the n. of Asia. It is less fragrant than garden thyme, but both species contain an aromatic essential oil. The flowering branches (*herba thymæ* and *herba serpylli*) are used in medicine as a powerful stimulant, and those of garden thyme are also used in cookery for flavoring. The **LEMON T.**, or lemon-scented thyme of our gardens, is regarded as a variety of *T. ser-*

pyllum. It is generally of still lower growth than the common garden thyme.—No species of thyme is indigenous in America.

THYMELEACEÆ, a natural order of exogenous plants, of which the mezereon and spurge laurel (see **DAPHNE**) are familiar examples. This order consists chiefly of shrubs, with a few herbaceous plants, and contains about 300 species, natives chiefly of the warmer temperate countries. The leaves are undivided. The perianth is inferior, tubular, colored, four-cleft, or rarely five-cleft, sometimes with scales in the orifice. The stamens are perigynous, often eight, sometimes four, and less frequently two. The ovary is one-celled, and the fruit one-seeded, either nut-like or a drupe. The bark is generally fibrous and tough. That of *gnidia Daphnoides* is used in Madagascar for ropes, and that of *leguetia linearia*, or lace-bark, in the West Indies for whips. The bark of some species of *Daphne* and nearly allied genera is made into paper in the east. See **DAPHNE**. Poisonous properties prevail in the order. The bark is in general very caustic, and that of some species is used as a vesicatory, and for other medicinal purposes.

THYMIC ASTHMA. See THYMUS GLAND.

THYMUS GLAND, or simply the thymus (Gr. *thymos*, sweet thyme, because the gland was compared to the flower of this plant by Galen), one of those structures which, like the spleen, suprarenal capsules, and thyroid gland, are placed among the ductless glands. It is a temporary organ, and is commonly stated to attain its greatest development in relation to the rest of the body during the latter part of fetal life. "But this," says Dr. Carpenter, "is a mistake, for the greatest activity in the growth of this organ manifests itself in the human infant soon after birth: and it is then, too, that its functional energy seems the highest. This rapid state of growth, however, soon subsides into one of less activity, which merely serves to keep up its proportion to the rest of the body; but its increase is continued till the age of puberty is attained."—*Principles of Human Physiology*, 6th ed. p. 143. After remaining stationary for some years, it gradually assumes, in well nourished persons, the characters of a mass of fat. On examining the gland when its growth is most active, it is found to consist of two lateral lobes placed in contact along the middle line, extending from the lower border of the thyroid gland to the cartilage of the fourth rib, and covered by the sternum and by the margins of the muscles passing upward from the top of that bone. The gland is of a pinkish gray color, soft and lobulated on its surfaces; and by careful manipulation it may be shown to consist of an assemblage of hollow glandular lobules, united together by connective tissue, all their cavities communicating with a central reservoir or main canal, from which there is no outlet. This arrangement is well seen in the gland of a calf. The thymus is about 2 in. in length, one and a half in breadth, and 4 lines thick, and at birth it weighs about half an ounce; its chemical constituents are water, albumen, gelatine, sugar(?), fats, leucine, sarkine, xanthine, and formic, acetic, succinic, and lactic acids, besides the ordinary inorganic salts—the number of the ingredients, many of them of rare occurrence elsewhere in the body, indicating that important chemical changes take place in their structure. Its exact uses are unknown, but, like the other ductless or vascular glands, it doubtless plays some important part in the preparation and maintenance of the blood. The albuminous nature of the juice of this gland, and the finely granular appearance it presents, indicate that a material is here being prepared which is to be rendered subservient to nutrition; and various facts which have been noticed in regard to its changes of bulk, (especially its rapid diminution in over-driven lambs, and its subsequent gradual redistention during rest, if plenty of food is given) strongly confirm these views.

The anatomy, physiology, and development of this gland have occupied the attention of three of the most celebrated writers of the present century: see sir Astley Cooper's beautiful monograph, *On the Anatomy of the Thymus Gland*, (1832); Mr. Simon's *Physiological Essay on the Thymus Gland*, (1843); and prof. Goodsir's memoir "On the Development of the Thymus Gland," in the *Philosophical Transactions* for 1844.

The only disease of this structure requiring notice is hypertrophy—a condition which was supposed occasionally to induce suddenly fatal dyspnoea (breathlessness) in children. There are, however, sound reasons for believing that there is no essential connection between the glandular enlargement and the suffocative paroxysms; because (1) the affection termed *thymic asthma* may occur with an abnormally small thymus; and (2) when a thymus, enlarged by malignant disease (encephaloid, for example) does occasion dyspnoea, it is not sudden and paroxysmal, but constant in its nature. The disease is known under various other names, as *laryngismus stridulus*, *spasmodic croup*, and *child-croaking*. This *bastard croup*, as Dr. Watson calls it, is far more common than true croup, and is very liable to be confounded with it. "In their most obvious symptoms, the two affections are much alike. The broad and essential difference between them is the absence in the spurious disorder of inflammation and of fever, and consequently of any concrete or other effusion from the mucous membrane of the air-passages. The child is seized all of a sudden, roused perhaps from its sleep, or checked in the act of sucking, by a catch, or interruption of its breathing, more or less complete. It strives and struggles to inspire, but is apparently unable to do so; at length the effort is successful, and the breath is drawn in with a shrill whistling or crowing sound, like that which characterizes the inspirations of croup, or of whooping-cough, and depending, no doubt, upon the same cause—a nar-

rowing (in this complaint, temporary) of the fissure of the glottis."—*Lectures on the Principles and Practice of Physic*, 4th ed. vol. i. p. 866. The more complete the closure of the chink of the glottis is, the more intense will be the symptoms. In severe cases the countenance becomes livid, the eyes fixed, and there is an entire suspension of the respiratory functions for a while. The child makes vehement struggles to recover its breath, and at varied intervals, from a few seconds up to a minute or longer, air is admitted through the glottis, now partially open, and this rush of air produces the characteristic sound. A fit of coughing or crying then often supervenes, and the attack terminates with some exhaustion. If, however, the glottis does not partially open, the child will die suffocated (or in popular language, *in a fit*) at the end of two, or at most three minutes, falling back pallid and exhausted in its nurse's arms. In association with these symptoms is often a contracted state of the flexor muscles of the thumb, fingers, toes, wrist, and ankle, giving to the foot an appearance like that of a club-foot. It has been observed by Dr. Ley, who has written a volume, on this disorder, and other observers, that there is a frequent connection between child-growing and certain other affections, as (1) tumefaction of the glands in the neck and chest, and entanglement of the pneumogastric nerve or its branches among these glands; (2) painful dentition, which is apt to produce glandular swellings of the neck; and (3) excoriations behind the ears, and inflamed and irritable scalp, which also occasion enlargement of the glands. The nerves passing from the enlarged gland to the nervous center convey the sensation of irritation; and the inferior laryngeal nerve, which supplies nearly all the muscles of the larynx, acts on the efferent or motor nerve, and excites spasmodic contraction of the muscles closing the aperture of the glottis. Hence the phenomena are those of reflex action.

During the paroxysm, the warm bath may be tried if it can be got ready at once. The application of hot fomentations to the throat by means of a large sponge, is often very serviceable, and is usually more accessible than the bath. The muscles sometimes relax when cold water is freely sprinkled over the chest and face, and these simultaneous applications of hot and cold water are by no means incompatible. The subsequent general treatment must depend upon the exciting cause, on the painful dentition, the eruption of the head, etc. The state of the bowels and of the skin must always be carefully regulated, and change of air is always advisable. Phosphate of lime, in doses of from 5 to 10 gr. 3 times a day, administered in chalk mixture, has been strongly recommended by Dr. W. Budd in this disease, and is well deserving of a trial.

THYROID BODY or GLAND (Gr. *thyreos*, a shield, and *zidos*, like), one of the ductless or vascular glands, lying at the upper part of the trachea, and consisting of two lateral lobes, placed one on each side of this canal, and connected together by a narrow transverse portion at the lower third, called the isthmus. It is of a brownish red color, and its normal weight is about an ounce, but it occasionally becomes enormously enlarged, constituting the disease called bronchocele or goiter. Each lobe is somewhat conical, and is about two inches long and three-quarters of an inch broad. The thyroid body differs from the other vascular glands in structure, for it "consists of an aggregation of closed vesicles, which seem to be furnished with a true liminary membrane, and therefore to be real gland vesicles embedded in a stroma of connective tissue, and not communicating with any common reservoir. These bodies vary in diameter in the human subject from $\frac{1}{2000}$ to $\frac{1}{5}$ of an inch; and they contain an albuminoid plasma, which is either faintly granular or of a somewhat oily aspect, amid which are seen a number of corpuscles, the greater part of them in the condition of nuclei, while some have advanced to that of cells."—Carpenter's *Principles of Human Physiology*, 6 ed., p. 143. The thyroid body is abundantly supplied with blood by the superior and inferior thyroid arteries, which continue subdividing till they ultimately form a very minute capillary plexus upon the liminary membrane of the vesicles. This body, like the thymus and suprarenal capsules, is relatively larger in the fetus and during infancy than in after-life.

From the investigations of Mr. Simon (see his memoir on the "Comparative Anatomy of the Thyroid," in the *Philosophical Transactions* for 1884), it appears that a thyroid is present in all mammals, birds, reptiles, and amphibians, and that he has discovered it in many fishes. Its presence in some of the fishes in which Mr. Simon observed it, has, however, been called in question by Dr. Handfield Jones, (see his article "Thyroid Gland" in the *Cyclopædia of Anatomy and Physiology*).

Mr. Simon has propounded a theory regarding the function of this gland which is certainly ingenious, and probably correct. Basing his theory on the circumstance, that the thyroid arteries arise in close proximity to the cerebral, he considers that the thyroid gland acts as a diverticulum to the cerebral circulation, exercising at the same time its secreting function in an alternating manner with the brain.

Little need be said here regarding the diseases of this organ, as the most important of them, bronchocele or goiter, has been already described under the latter title.

THYRSUS, in botany, a panicle (q.v.), in which the flower stalks are short, and the flowers are thus close together, so that the panicle is dense. It is a very common form of inflorescence. The use of the term is, however, somewhat vague.

THYSANURA, an order of wingless insects of small size, and which undergo no metamorphoses. They are furnished with peculiar organs, either along their sides or at the extremity of the abdomen, which, as well as the legs, are used for locomotion. The

whole order is comprised in two families—*podurida*, or spring-tails (see *PODURA*), and *lepismide*. The *lepismide* have an elongated body, covered with small shining silvery scales. The abdomen is furnished on each side with a series of movable appendages; it has also at its extremity a compressed appendage of two pieces, and three jointed bristles, which are used in leaping. The *lepismide* inhabit dark and moist places, as behind window-shutters, beneath planks, etc.; many of them often in the interior of houses.

TI, *Cordylone ti*, formerly *dracena terminalis*, a plant of the natural order *liliaceæ*, and nearly allied to the dragon tree. See *DRAGON'S BLOOD*. It is found in the s.e. of Asia, the eastern archipelago, the Sandwich islands, and many other island groups of the Pacific ocean. It attains a height of 10 or 12 ft., sometimes more, with a tree-like form, lanceolate leaves of a reddish hue, and branching panicles. The fruit is a three-celled and three-seeded berry. The leaves afford food for cattle. They also form durable thatch for houses. Their fibers are sometimes made into cloth. It is most valuable, however, for its root, which is very large, and when raw, is hard, fibrous, and almost insipid; but becomes soft and sweet when baked—is very nutritious, and much used as an article of food. Good sugar is also made by evaporating its juice; the fermented juice is used as an intoxicating beverage, and a kind of ardent spirit is distilled from it.

TIAHUANUCO, an elevation of land over 12,000 ft. high in Bolivia, 38 m. n.w. of La Paz, on lake Titicaca, supposed to have been an island in the lake at some remote period, and containing some remarkable ruins, formed of beautifully carved blocks of stone, of gigantic size, many of them joined together with bronze, and giving no clue to their age, though evidently antedating the incas. One theory makes it a place of worship of an ante-historic race, and not an inhabited place.

TIA'RA, the triple crown of the pope, which is considered to be symbolical of his temporal, as the keys are of his spiritual authority. It is composed of a high cap of gold cloth, encircled by three coronets, with a mound and cross of gold on the top. From the cap hang two pendants, embroidered and fringed at the ends, and *semée* of crosses of gold. The original papal crown consisted of the cap alone, and was first used by pope Damasus II., 1048 A.D. The cap was surrounded with a high coronet by Boniface VIII. in 1295; the second coronet was added in 1335 by Benedict XII.; and the third by John XXIII. in 1411.

TIBER, the chief river of central Italy, and the most famous in the peninsula, rises from two springs in a wood of beech trees in a dell of the Tuscan Apennines (province Arezzo), about 6 m. n. of the village of Pieve-San-Stefana, and in lat. about 43° 45' north. Its course until it reaches Perugia is s.s.e.; thence, as far as Rome, it pursues, along an irregular zigzag line, a southern direction: but when it enters the plain of the Campagna, it curves to the s.s.w., and enters the Mediterranean by two branches, which inclose the Isola Sacra. The entire course of the river is about 212 miles. The most celebrated towns on or near its banks are Perugia, Todi, Orvieto, Rome, and Ostia; and its chief affluents are the Nera (anc. *Nar*), and Teverone or Aniene (anc. *Anio*) from the left, and the Chiana from the right. In the upper portion of its course, from its source to the city of Orvieto, it is rapid and turbid, and of difficult navigation. It is regularly navigable for boats of 50 tons to the confluence of the Nera, 100 m. from its mouth, and small steamers ascend to within 7 m. of that point. Wine, corn, charcoal, wood, and other produce from the interior are conveyed by the Tiber to Rome. Within the walls of Rome (q.v.), the width of the river is 300 ft., and the depth from 12 to 18 feet. Of its two mouths, the northern, the Fiumicino, is the channel of commerce; the southern, the Fiumara, is useless for commercial purposes, owing to the accumulation of sand at its mouth. The Tiber is supplied mostly by turbid mountain currents, whence its liability to sudden overflows of its banks; even the oldest Roman myth, that of Romulus, being inseparably associated with an inundation. Its waters, too, are still discolored with yellow mud, as when Virgil described it—

Vorticibus rapidis et multa flavus arena.

TIBERIAS. See GALILEE.

TIBERIAS, SEA OF. See GENNESARET, *ante*.

TIBERIUS, **TIBERIUS CLAUDIUS NERO CÆSAR**, the second emperor of Rome, was the son of Tiberius Claudius Nero, one of the active partisans of Pompey and Antony in the war of the second triumvirate, and of Livia, a descendant of Appius Claudius Cæcus, and was born Nov. 16, 42 B.C. The triumvir, Octavianus Cæsar (afterward the emperor Augustus) having become enamored of Livia, the complaisant husband divorced her, and, though then pregnant with Drusus, she was immediately espoused by Octavianus (38 B.C.). Tiberius being now one of the imperial household, received a careful education, was allowed by Augustus the same public honors as were paid to his nephew and grandsons, and as well as his brother Drusus, was employed in active service at the head of the legions on the outposts of the empire. Tiberius was at this time in favor with the emperor and the Roman people, chiefly because his retired mode of life and subordinate position restrained his evil propensities; and his praises as a military leader were loudly sounded, though the character of his opponents was not such as called for the display of very great warlike ability. At the command of Augustus, he unwillingly divorced his wife, Vipsania Agrippina, to marry the emperor's daughter Julia (11 B.C.); but disgusted

at her open profligacy, he gladly accepted a command on the German frontier, and afterward (6 B.C.) retired to Rhodes, where he lived for seven years, returning after Julia's banishment to Pandataria. The death of two of Augustus's three grandsons paved the way for the adoption of Tiberius, and of the third grandson, Agrippa Postumus, by the emperor, and for the appointment of Tiberius as heir to the throne, Agrippa being, apart from his youth, wholly unfitted for the exercise of uncontrolled authority. Accordingly, Tiberius ascended the throne (14 A.D.), and by his manly and graceful demeanor, prudence, and moderation, gave promise of a happy reign. His mild and benignant sway at first was doubtless due in part to the necessity of outbidding his popular nephew Germanicus (who was of Octavian blood by his mother's side) for public favor; but after his kinsman's death (19 A.D.), and the removal of all who were likely to put forth claims to the throne, Tiberius's true character became better known. He had always shown himself reserved, jealous, timid, and irresolute, though not cowardly, and almost devoid of sympathy and affection; and with the scepter firmly in his grasp, the development of these qualities produced the most suspicious and cruel of tyrants. During the life of his mother, however, Tiberius, who held her somewhat in dread, took little share in the government, but led a retired life, attempting to ape the virtues he had not. The chief events of this part of his reign were the increase in number and amount of the taxes, the removal of all power from the people and the senate, and the institution of prosecutions for *læsa majestas*, the latter being nothing else but a convenient mode of removing all who incurred the displeasure of the emperor. But after Livia's death (29 A.D.), he resigned the whole real authority into the hands of Ælius Sejanus, a Roman knight and a commander of the prætorian guards, and gave himself up to the unrestrained indulgence of his sensual appetites. The empire did not suffer by the change, for Sejanus was a man of great ability and resolution, and well knew how to maintain his ascendancy over the emperor by pouring into his suspicious ear tales of conspiracy, and then allaying the imperial fears, and satisfying his own private enmities by the condemnation for *læsa majestas* of eminent Roman citizens. In 27 A.D., Tiberius retired to the island of Capri, there to wallow in his brutish enjoyments with more freedom, leaving Sejanus, whom he made his coadjutor in government, and equal in position, at the head of the government; and from this period till the discovery of the ambitious aspirations of Sejanus, and his downfall (31 A.D.), the Roman annals are crowded with proscriptions at Rome, and infamous excesses at Capri. Sejanus's successor, Macro, had all his vices, and few or none of his talents, and so the state of affairs was even worse than before, the senate exhibiting a rare degree of sycophancy, by indorsing with the most accommodating promptitude every order, however tyrannical, of the emperor or his confidant. It may seem strange that this frightful misgovernment by an aged debauchee and his ignoble favorite should have been so quietly submitted to by the Romans, but in reality their tyranny was confined exclusively to those of rank, the common people being treated with forbearance and occasional liberality, as there was nothing to fear from them. Tiberius's powerful constitution was at last completely destroyed by his excesses, and falling sick at Astura, he traveled to Misenum, where, in the villa of Lucullus, he ended his infamous life, Mar. 16, 37 A.D., his death being hastened a few days either by poison or suffocation.

TIBET. See **THIBET**, *ante*.

TIBULLUS, ALBIUS, the Roman elegiac poet, was born of equestrian family, probably 54 B.C., and died young, not long after Virgil, about 18 B.C. We know nothing of his youth or education. From his equestrian ancestors he inherited an estate at Pædum, between Tibur and Præneste, which, like the estates of Virgil and Horace, had been either wholly or partially confiscated in the civil wars. Tibullus, however, recovered part of his property, and spent upon it the best part of his short life. He was patronized by Messala, whom, in 31, he accompanied into Aquitania, to suppress a serious revolt which had broken out in that province. He was present at the battle of Atax, which gave the final blow to the insurgents; and he celebrates in a fine strain of poetry, the honorable part he bore in the campaign. Next year, Messala was sent to the East and again Tibullus accompanied him; but having been obliged from illness to stop at Coreyra, he returned to Rome. At this point, the public life of Tibullus ceases; and henceforth he devoted himself to the study and composition of poetry. His *Elegies*, divided into four books, are mainly addressed to his mistresses, Delia, Nemesis, and Glycera, whose inconstancy or coldness he bewails in tender and exquisitely finished verses. The third book, however, is now believed to be the work, not of Tibullus but of another and inferior poet; while the hexameter poem on Messala, with which the fourth book opens, is from internal evidence, supposed to be also by another and inferior hand. Only the first book was published during the poet's lifetime, which, brief as it was, yet passed peacefully away amid all the blessings of pecuniary competence, patronage of the great, health, and fame. The character of Tibullus was singularly pure, amiable, and winning. During life, he had the honor of being addressed in an ode and epistle by Horace; after death, of being bewailed in an elegy of matchless beauty by Ovid. The best edition of his poems is that of Disen (Göttingen, 1835).

TIBUR. See **TIVOLI**, *ante*.

TIC DOULOUREUX. See **NEURALGIA**

U. K. XIV.—26

TICHBORNE TRIAL, a celebrated conspiracy case in the legal records of England, in which an impostor, who assumed the identity of an heir to claim his estate, was found guilty and sentenced to fourteen years' penal servitude. Roger Charles Tichborne was born in 1829, and after his education in France and at the Roman Catholic college of Stonyhurst, he entered the English army in 1849. In 1852 he offered to marry his cousin Kate, the daughter of his uncle, sir Edward Tichborne; but failing to obtain the consent of her parents, resigned his commission, sailed for Valpariso, and in 1854 left Rio de Janeiro on board the ship *Bella* which was lost at sea. Sir Edward Tichborne died in 1853, and was succeeded by his brother James. The latter died in 1862, and as his eldest son Roger was supposed to be lost on the *Bella*, he was succeeded by his second son Alfred, who lived only till 1866. A posthumous son was born three months after the death of Alfred, and was accepted as the heir to the Tichborne estates. In 1865 Lady Tichborne, widow of Sir James, advertised in English and Australian newspapers for her son Roger, whom she believed to be living. In 1867 a butcher of Wagga Wagga, Australia, where he was known as Thomas Castro, sailed for Paris, and was accepted by lady Tichborne as her son Roger; although nearly every other member of the family considered him an impostor. He found, however, many adherents, and traveled about England to secure witnesses and obtain information concerning incidents in the life of Roger Tichborne. In 1867 he filed a bill in chancery to restrain the trustees of the estates from setting up certain outstanding terms as an answer to any action he might bring to recover the property. The trial was delayed for nearly four years by various causes, especially by sending commissions to Australia and South America. Lady Tichborne died in 1868, but there were so many persons who believed in the claimant that he was able to borrow large sums of money to pay the expenses of the trial, which was commenced in 1871. It continued for 103 days when the jury declared themselves satisfied that the claimant was not Roger Charles Tichborne, and he was nonsuited. He was then imprisoned to be tried for perjury, but was released on bail. His trial for perjury was begun in the court of queen's bench in 1873, and lasted 188 days, till Feb. 28, 1874, when he was found guilty and sentenced to fourteen years' penal servitude. The career of the claimant was traced from the time he left England to the time of the trial, and it was clearly shown that his real name was Arthur Orton, a native of London, who emigrated to Australia where he assumed the name of Thomas Castro. He was entirely ignorant of incidents in the life of Roger Tichborne during his residence in France, and knew no French, which Roger spoke more fluently than English. His handwriting was entirely different, and he was very illiterate, while Roger had been well educated. It was also proved that he did not resemble Roger in his physical appearance. In consequence of the trials the trustees were obliged to mortgage the Tichborne estate. See *Charge of the Lord Chief Justice in the Case of the Queen v. Castro* (London, 1875).

TICHVIN', a t. of great Russia, in the government of Novgorod, 163 m. e.s.e. of St. Petersburg, on the Tichvinka, which, together with the canal of the same name, connects the Volga with the Baltic. It contains numerous churches, but is best known for its monastery, which contains a "thaumaturgical" or miracle-working image of the Virgin. The inhabitants are chiefly employed in the transit-trade by land and water. Pop. '67, 6,048.

TICINO, a river of Switzerland and the n. of Italy, rises on the southern slopes of Mt. St. Gothard, and flows s. through lake Maggiore, and s.s.e. through the n. of Italy to its junction with the Po, about four m. below Pavia. Entire length about 120 m., for the last 75 of which, from the point at which it leaves lake Maggiore, it is navigable.

TICINO, the most southern canton of Switzerland, bounded on the w. and s. by Italy, and on the e. by Italy and the canton of Grisons. Area, 1082 sq. m.; pop. '76, 121,768. Its surface, forming a portion of the southern slope of the Alps, comprises lofty mountains in the north. The northern boundary between Ticino and the cantons of Uri and Grisons is a range of the Lepontine Alps, rising in Mt. St. Gothard (q.v.) to the height of about 12,000 feet. Offsets from the Lepontine and Rhaetian Alps occupy the greater part of the canton. In the south the country falls away into flats, and the scenery becomes Italian in character. The principal rivers are the Ticino (q.v.), by which the whole of the canton, with the exception of a trifling portion, is drained, and from which it receives its name. In the north, cattle-breeding and the preparation of dairy produce are the chief employments. South of the Alpine regions are elevated forest-clad districts; and further south, olive-yards and vineyards, corn-fields and plantations of figs, almonds, oranges, citrons and pomegranates occur. The canton varies as much in climate as in productions. Cattle, cheese, wine, fruits, and hay are exported. The northern part of lake Maggiore, and almost the whole of lake Lugano, are included within the canton. The inhabitants belong to the Italian type, and for the most part speak the Italian language, and are of the Catholic religion. The chief towns are Bellinzona, Locarno, and Lugano, each of which is by turns the seat of government.

TICK, the popular name of a great number of *acarides* (see ACARUS), forming a section called *suctoria*, having the mouth in the form of a sucker, with no apparent mandibles. They live by sucking the juices of plants and animals. Some of them are

aquatic. The harvest-bug (q. v.) is a well-known example of the suctorial *acarides*. It belongs to a family called *leptide*. The name Ticino is more particularly given to the family *ivodide*. They abound in almost all parts of the world, but chiefly in warm countries, in which they are very troublesome pests. Many of them live in woods, attached to branches, but are ready to attach themselves to animals, which sometimes suffer greatly from their numbers, their blood-sucking powers, and the inflammation which they cause. The tampan (q. v.) is a very troublesome tick of s. Africa. The carapata of Brazil is scarcely less annoying. It infests dry bushy places, clusters of many hundreds being found clinging to very slender twigs, and they instantly transfer themselves to any horse, ox, or other quadruped which comes in contact with them, burying their serrated suckers in its skin, so that they cannot be withdrawn without considerable force. If not taken off, they go on increasing in size, till they become as large as a horse-bean, or even larger. Whole herds of cattle sometimes perish from the exhaustion which they cause. Wet weather, however, soon kills them, and an animal made to swim across a river, is almost freed from them at once. Travelers in the interior of Brazil are sometimes obliged to pick hundreds off their own bodies before retiring to rest for the night.—The Dog Tick (*Ixodes plumbeus*) is common in Britain, abounding on ferns in fir plantations, etc., in many places in autumn, and attaching itself to dogs, oxen, and other animals, sometimes even to man. It is in form and size like a grain of linseed, oval, shining, reddish, with a pale margin. The body swells to the size of a small horse-bean after the tick has attached itself to an animal, and the wound is attended with much inflammation and pain. Tortoises have ticks peculiar to them, which adhere to their neck, and by the thickness of their leathery coat, are preserved from being crushed when the head is retracted within the carapace.

TICKELL, THOMAS, 1686-1740, b. England; educated at Oxford, where he was appointed fellow in 1710. He attracted the attention of Addison by some lines praising the latter's *Rosamond*; and Addison, becoming sec. of state in 1717, made him under-secretary. He was sec. to the lord justices of Ireland from 1725 till his death. He published *Prospect of Peace* (1713); *The Royal Progress* (1714); and a poetical version of the 1st book of the *Iliad* (1715). His best known poem is *Colin and Lucy*. Goldsmith calls his *Elegy on Addison* "one of the finest odes in our language."

TICKET OF LEAVE is a term which is properly applied only in regard to convicts in the Australian colonies. A kind of permit was given to them after a certain period of their sentences, if they could be trusted at large. It required the convict who held it to remain within a particular district. The term was afterward popularly applied to the kind of document called technically an "order of license," which sets a convict at large in the British empire before the expiry of his sentence. The occasion of its being first used was when, after the year 1840, the colonies, one after another, refused to receive convicts. If those sentenced to transportation were kept in prison in this country for the whole period of sentence, its severity would be greatly increased; and hence, by way of compensation to the convicts not taken abroad, part of their sentence was remitted. On the form of the sentence being recently changed from transportation to penal servitude, the partial remission was made systematic, as an inducement to good conduct and industry. Under the existing act of 1864, the period of remission which may thus be gained, is for males about a fourth, and for females about a third, of the whole sentence. The method of adjusting the period is by debiting the convict with so many marks, representing the amount of industry that must be accomplished to gain the largest period of remission; and according to the proportion of these gained is the amount of remission or order of license or ticket of leave. See CONVICT, PRISON DISCIPLINE.

TICKING, a strong cloth, used chiefly for making beds, mattresses, and paillasses. Formerly, it was always manufactured of linen, but cotton is now largely used for this purpose. A very general character of ticking is that it is woven in stripes of two colors, blue and white.

TICKNOR, GEORGE, an American scholar and author, born in Boston, August 1, 1791; educated at Dartmouth college; admitted to the bar in 1811, but devoted himself to literature. From 1815 he spent four years in Europe, residing at Göttingen, Rome, Madrid, Paris, Edinburgh, and London, where he made the acquaintance of the most distinguished men of letters. Returning to America, he became professor of French and Spanish languages and literature in Harvard university. In 1835, resigning his professorship, he went with his family to Europe, where he remained three years, collecting materials for his *History of Spanish Literature* (New York, 1849, 3 vols. 8vo), an exhaustive and admirable work, which has been translated into Spanish and German. Mr. Ticknor also edited *The Remains of Nathaniel Appleton Haven*, and wrote a *Life of Lafayette*, first published in 1824 in the *North American Review*. He published in 1864 a biography of his friend, W. H. Prescott, the historian. Mr. Ticknor died in 1871. See *Life, Letters, and Journals of George Ticknor* (Boston, 1876).

TICKNOR, WILLIAM D., 1810-64; b. Lebanon, N. H., established himself in the book trade in Boston, 1832; head of the firm of William D. Ticknor & Co., then Ticknor, Reed & Fields; afterward Ticknor & Fields. He had fine literary culture, and was warmly esteemed by many well-known authors whose works were published by his house.

TICONDEROGA, a small township in New York, U. S., on lake Champlain, inclosing the outlet of lake George, 95 m. n. by e. of Albany; and the name also of a lofty promontory in the township, of which the extremity, mount Defiance, rises 750 feet above the lake. The falls of the outlet of lake George, 150 ft. in $1\frac{1}{2}$ m., afford constant water-power for timber mills; and a vein of graphite supplies 30 tons of fine black-lead a year. The promontory was fortified by the French in 1755. In 1757 Montcalm assembled here a force of 9,000 men, with which he took the English fort, William Henry, on lake George. In 1758, general Abercrombie with 15,000 men attempted to storm the French fort, then called Carrillon, but was repulsed with a loss of 2,000. In 1759 it was invested by general Amherst, and the French dismantled and abandoned both this fort and Crown Point, which were then enlarged and strengthened by the English at a cost of £2,000,000. Being weakly garrisoned after the cession of Canada to Great Britain, it was, in 1775, surprised and captured by Ethan Allen. In 1777 it was recaptured by general Burgoyne, by erecting a battery on an unprotected height which commanded it; but after the surrender of Burgoyne, it was dismantled and abandoned. It was again occupied by the British troops in 1780, and at the close of the war became a picturesque ruin.

TIDBALL, JOHN C., b. Va., 1828; graduated at West Point, 1848, and was commissioned in the artillery. He served in the Seminole war and on the coast survey. In the civil war, he took part in the battles of Bull Run, Antietam, Chancellorsville, and Gettysburg. In 1863 he was made a colonel of artillery, and commanded a regiment through the Richmond campaign of 1864. The same year he was for a short time commandant of cadets at West Point. He received brevet grades up to and including that of maj. gen.

TIDE-MILL. See **WATER-POWER.**

TIDES. It was known, at least as early as the time of Cæsar, though probably long before, that the time of high-water, and also the height of the tide, are in some way connected with the age of the moon. And even in the present state of science, what is called the *establishment* of a port, or the time of high-water at new or full moon (that is, the interval between the moon's crossing the meridian and the full tide), which is practically the most important part of the whole question, cannot be predicted by theory, but must be obtained by observation. The first attempt to explain the phenomena of the tides was made by Newton; and, considering the little that has, since his time, been effected, his approximate solution must be pronounced highly creditable, although in many respects unsatisfactory. D. Bernouilli and others have since slightly improved Newton's method; and a complete solution of the problem has been attempted by Laplace. The principles involved in this solution are undoubtedly correct, and the result, so far as it goes, leaves little to be desired. But it does not go far, for two reasons: we know very little as to the depth of the sea; and, even had we that knowledge, the excessive difficulties of the mathematical processes required in taking account of it, and of the forms of continents and islands, would be such as to render Laplace's method inapplicable.

Newton's approximate method consists in the study of the problem as a *statical* one, and this we will presently describe. Laplace, on the other hand, treats the problem as one of *fluid motion*. Airy and others have, more recently, attempted, with success, to simplify Laplace's process. Curiously enough, however, the results of all these theories are very much alike; and, while some of the results agree well with observation, others seem irreconcilable with it. We cannot explain Laplace's method without employing high analysis, quite unsuited to this work; so we must be content to describe the faulty theory. In the Newtonian or *equilibrium* theory, we consider the earth to be spherical, and covered with a layer of water, which would, of course, if left to itself, be uniformly deep over the whole surface. The attraction of the moon (per unit of mass) on the water immediately below her, is greater than her attraction on the solid earth (per unit of mass), and tends, therefore, to raise the water at that part of the surface. At the point of the surface directly opposite to the moon, the water-layer is further from the moon than the bulk of the earth, and, consequently, the moon attracts the water (per unit of mass) *less* than it attracts the earth. The tendency is, as it were, to pull the earth away from the water, so that here also the water is raised, though not *quite* so much as on the other side, as the moon's attraction diminishes with distance. The effect of the moon's action on the previously uniform layer of water is thus to elongate it both ways in the direction of the line joining the centers of the earth and moon. On account of the very small amount of this elongation, it is found by mathematical processes, which we cannot give here, that the form of the surface will become very nearly a prolate spheroid (a solid formed by the revolution of an ellipse about its *longer* axis).

[Before proceeding further with our explanation, it is necessary to say a few words with reference to a mistake often fallen into by those whose knowledge of mechanics is scanty; and at times paraded with a show of learning by a class of men who doubt such plain matters of fact as the moon's rotation, the oblateness of the earth, the inertia of matter, and what not. Such people say that, since, if the moon and earth were rigidly fixed to each other, the water would rise only on the side next the moon, this must be the case in nature also. This is the same mistake as those commit (see **PERTURBATIONS**)

who allow that at new moon the sun virtually diminishes the moon's gravitation toward the earth, but refuse to allow that the same is true at full moon.]

We have next to consider that the moon revolves about the earth, and that the earth also revolves about its axis. Thus, the equilibrium figure has never time to form; but an imperfect form of it travels round the earth in the time of a lunar day (24 hours 54 minutes). If the moon be on the equator, it is obvious that similar portions of the water-spheroid will reach any one spot on the earth at intervals of half a lunar day (12 hours 27 minutes). If the moon's declination be considerable, such will not be the case—a place, for instance, whose latitude is equal to the moon's declination, will be reached by one pole of the wave-spheroid when the moon is on the meridian; but in 12 hours 27 minutes, the other pole of the spheroid will not pass over the place, but at a meridian distance of twice the latitude of the place, or twice the moon's declination. Thus, when the moon's declination is sensible, the two tides of each day are not generally equal in height, except for places on the earth's equator. This gives rise to what is called the *diurnal* tide, which is, as it were, superposed upon the ordinary, or *semi-diurnal*, tide, and ought to be more sensible as the latitude is greater. Owing to fluid friction, and other causes, we should expect that the axis of the tidal spheroid would lag a little behind the moon, and this is found to be the case.

So far, we have a general explanation of the occurrence of tides twice a day, and of their dependence on the moon. But we started with two assumptions which are not consistent with fact, viz., that the earth is spherical and uniformly covered with water, and that the moon is the only tide-producing body. The corrections to be made in consequence of the inaccuracy of these assumptions must now be explained. We commence with the latter. The sun, although at an immense distance compared with that of the moon, has such an enormous mass, that his tide-producing influence is comparable with that of the moon. In fact, it is easy to see that, as Newton showed, the tide-producing power of an attracting mass is directly as the mass, and inversely as the *cube* of its distance. That it is directly as the mass, is obvious. To prove the other assertion, let R be the earth's radius, D the distance of the attracting body from the earth's center, then the attraction per unit of mass on the earth is to that per unit of mass on the water nearest the attracting body as

$$\frac{1}{D^2} \text{ to } \frac{1}{(D-R)^2},$$

according to the law of gravitation. The difference between these quantities is proportional to the tide-producing force. But

$$\frac{1}{(D-R)^2} = \frac{1}{D^2(1-\frac{R}{D})^2} = \frac{1}{D^2} (1 + \frac{2R}{D} + \text{etc}) = \frac{1}{D^2} + \frac{2R}{D^3} + \text{etc.}$$

the remaining terms being omitted, since D is always much greater than R . The difference is therefore approximately

$$\frac{2R}{D^3}$$

as stated above.

Now the mass of the sun is to that of the moon as 355,000 to 0.0125, and the sun's distance is about 400 times that of the moon. Hence the tide-producing power of the sun is to that of the moon as

$$\frac{355,000}{0.0125} \text{ to } \frac{400^3}{0.0125} \\ \text{or } 355 \text{ to } 800.$$

By calculations, which we cannot give here, it has been shown that the difference of length of the axes of the wave-spheroid produced by the moon alone is about 58 inches; so that in that due to the sun it will be about 25.7 inches.

In consequence of the extremely small amount of these effects on the sea-level, we are entitled to simply add or superpose the separate effects of the sun and moon, in order to obtain their joint effect. And now we have at once the explanation of what are called *spring* and *neap* tides. At new and at full moon, the wave-spheroids due to the sun and moon have their axes almost coincident, so that we have a tide which is to the lunar alone as $800 + 355$ to 800, or as 13 to 9 nearly; while, when the moon is in her first or last quarter, the axes are nearly at right angles, and the compound tide is to the lunar tide alone as $800 - 355$ to 800, or as 5 to 9 nearly. Thus the height of the spring-tide is to that of the neap-tide in the ratio of about 13:5.

Another curious phenomenon, which we can now easily account for, is the "priming" and "lagging" of the tides, or the *acceleration* and *retardation* of the time of high-water. If the tides were due to the sun or moon alone, they would recur at equal intervals of time; and, in fact, this is the case with the lunar and solar tides separately. But what we observe is the compound tide, and this will obviously have its maximum *between* two consecutive maxima of the lunar and solar tides; but nearer to the lunar tide as it is the greater. Thus, if about new moon the sun passes the meridian *before* the moon, the tide is accelerated; if *after*, it is retarded. And the same is true about full moon, only

that in this case our statement refers to passages of the sun and moon on opposite sides of the meridian. This retardation or acceleration has for its greatest value a period of rather less than an hour; and the respective maxima occur about $4\frac{1}{2}$ days before and after the spring-tides.

But we meet with far more serious difficulties when we come to consider the actual distribution of water over the earth's surface; and it is here that future improvements must be looked for.

But even so inadequate an attempt at a solution as is the equilibrium theory, gives us the means of explaining a great many curious observed phenomena. It shows, for instance, how exceedingly small we should expect to find the tides in an inland sea such as the Mediterranean; for there, even when the moon is most favorably situated, the utmost difference of level would be (by calculations which we cannot give here) only about an inch or two; and of this part would be the rise in one portion of the sea, the rest the fall in others. The popular explanation of this phenomenon is very simple. We have but to notice that, according to the equilibrium theory, the form of the water is a spheroid of definite dimensions, its axes differing from each other by 58 inches. But a small portion of such a spheroid (of the dimensions of the Mediterranean, for instance) can hardly be distinguished from a sphere; so that the form of the surface of a limited mass of water will be but slightly altered by the attractions of the sun and moon.

It is obvious from what we have just said, that the rise of the water in tidal rivers, estuaries, and deep bays, where it sometimes amounts (even in calm weather) to more than 100 ft., cannot possibly be due to the moon's action upon the water of the mere river or bay, but must be almost entirely produced by the tidal wave in the ocean; and, in fact, this part of the problem presents comparatively little difficulty. Once grant the fact of the tidal disturbance of sea-level at the mouth of a river, and the calculation of the motion of the consequent wave in the river-channel is within the power of mathematics. It is by means of investigations made from this point of view, and by others concerning the effect of the moon on long canals, that Laplace's method has been improved. For the details of the process, see Airy on "Tides and Waves," in the *Encyc. Metrop.* All we can do here is to point out a few of the immediate consequences of the periodic rise and fall of the sea-level as regards the motion of the water of a tidal river. Here the tide always runs *up* the river, even when, as in the case of the Severn, this is the opposite direction to that in which the moon appears to move. In the open sea at the mouth of the river, the interval from high to low-water is almost exactly equal to that from low to high-water, each being about $6\frac{1}{2}$ hours nearly. But the further we go up the river, the greater becomes the disparity between these periods, high-water following low-water at shorter and shorter intervals, while the intervals during which the tide falls are correspondingly increased. In some cases, as at certain points in the Seine and Severn, the interval from low to high-water is so short that the tide-wave rushes suddenly up, and spreading over the flat sands at the side of the channel, forms a dangerous surf called a *bore* (q.v.).

Connected with these peculiarities, there is also a singular effect produced on the direction of the current in a tidal river. In the open ocean, the water merely rises and falls, there being no perceptible tidal current. Sailors are in the habit of associating the cessation of currents, or "slack" water, with the occurrence of high and low water. This is the case in bays, but not in rivers, and it gives rise to some curious errors regarding the time of high-water in rivers. Thus it is sometimes said that it is high-water in the center of the Thames' channel long after it is high-water at the shore—an obvious absurdity. The truth is, the current does not cease simultaneously at the shore and in the mid-channel. At the mouth of a tidal river, the water runs upward for hours after high-water, and downward after low; and the same is true, in a less degree, at places higher up the stream.

When considerable alterations of breadth or depth occur in the channel of a river, we find corresponding alterations in the amount of rise of the tide. Thus, according to Airy, at the entrance of the Bristol channel, the whole rise at spring-tides is about 18 ft.; at Swansea, 30 ft.; and at Chepstow, 50 feet. At Annapolis, in the bay of Fundy, the tide is said to rise 120 feet. Again, the same port may be reached by tide-waves coming from the ocean by different channels; and here we have to compound the two disturbances just as we did with the separate lunar and solar tides. In the German ocean, we have a very good example; but the most remarkable is the tide at Batsham, in Tonquin. At this port, two tide-waves meet, coming respectively from the Indian and China seas; these bring, simultaneously, opposite but nearly equal changes in the water level, and the effect is, that there is almost no perceptible tide.

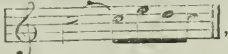
Whewell, Lubbock, and others have lately added much to our knowledge of the *facts* of the tides; and have constructed what are believed to be tolerably accurate charts of *cotidal lines*—that is, lines representing the positions of the crest of the tide-wave at hourly intervals as it sweeps round the earth. A great deal, however, remains to be done in this direction, before we can hope to elicit from observation such hints as may enable us to improve the mathematical theory of the subject.

The frictional resistance to the motion of the tide-wave of course produces heat. This heat is a transformation of part of the earth's energy (see FORCE) of rotation; and thus it

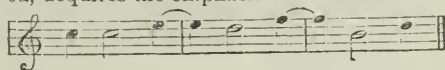
appears that the tides are gradually lengthening the day. We may see easily that this would go on, were the moon the only tide-producing body, so long as the earth rotates about her axes in less time than a lunar month. For if the length of the (sidereal) day were that of a lunar month, the earth would always turn the same face to the moon; and the tide-spheroid would have a *fixed* position on the earth, and there would be no loss of energy by friction. Simple as this deduction is, though it seems to be roughly guessed at by Kant, it was not formally enunciated till about thirty-five years ago. Mayer was the first to publish anything on the subject, but it seems to have been previously noticed by others. One of the most curious deductions from it is the recent speculation which assigns, as the cause of the moon's turning always the same face to the earth, the friction of the enormous tides which must have been produced by the earth in her mass when it was in a molten state, on the surface at least, if not throughout.

The only work with which we are acquainted from which complete information as to our present knowledge of the subject of tides may be obtained is that of Airy, in the *Encyclopædia Metropolitana*, already referred to.

TIE, in music, an arch drawn over two notes on the same degree, uniting them so that they are played or sung as one single note of the same value. Thus, for the two C's

written in the example , one is played of the value of a minim and

quaver combined. The tie is often used in syncopated passages to connect the last note of one measure with the first of the succeeding one, when the former note, which would otherwise be unaccented, acquires the emphasis of the latter:



See SYNCOPATION.

TIE BEAM. See ROOF.

TIECK, CHRISTIAN FRIEDRICH, 1776-1851; b. Berlin; studied sculpture under Schadow in Germany, and David in France; was employed at Weimar, 1801-5, and afterward in Italy; became a member of the Berlin academy, 1819, and was engaged with Schenkel and Rauch in improving the art. He executed at Carrara many busts in the Walhalla for the crown prince Louis of Bavaria; at Weimar those of Goethe and other poets; a statue of Neckar for Mme. de Staël: of his brother at Dresden, and decorations of the royal theater at Berlin, and other public buildings.

TIECK, LUDWIG, a brilliant and prolific German novelist and poet, was born at Berlin, May 31, 1773, and studied at the universities of Halle, Göttingen, and Erlangen. He made his first appearance as an author in the *Straussfeder* (Ostrich-feather) magazine, conducted by Musäus (q.v.) and J. G. Müller, for which he wrote a series of little tales, of which the best was *Die beiden Merkwürdigsten Tage aus Siegmann's Leben* (The Two most Remarkable Days in Siegmann's Life). But the originality of his genius first displayed itself in his romances of *Abdullah* (Berl. 1795) and *William Lovell* (3 vols., Berl. 1795). These were followed by his *Peter Lebrecht, eine Geschichte ohne Abenteuerlichkeiten* (Peter Lebrecht, a History without Adventures, 2 vols., Berl. 1795-96), and *Peter Lebrecht's Volksmärchen* (3 vols., Berl. 1797), which were equally remarkable for richness of fancy, artless simplicity, and an overflowing humor. In some of these *Märchen*, as, for example, his "Bluebeard," "Puss-in-Boots" (*Der gestiefelte Kater*), and "The Life and Death of Little Red Riding-hood" (*Leben und Tod des kleinen Rôthkappchen*), he combated with satiric humor, perhaps, too, with somewhat of youthful arrogance, the "enlightened" notions on which the literature of the 18th c. prided itself—showing very distinctly his strong tendencies toward the deeper poetic spirit of the middle ages. The same polemic was maintained in his comedy, *Die verkehrte Welt* (The Topsy-turvy World, 1799). To this period also belong his *Herzensergießungen eines künstliebenden Klosterbruders* (Heart-effusions of an art-loving Monk, Berl. 1799), *Franz Sternbald's Wanderungen*, an art-novel (2 vols., Berl. 1798), and *Phantasien über die Kunst* (Francis on Art, Hamb. 1799), all of which are full of a noble enthusiasm for art, but pervaded at the same time by a dreamy mystical religiosity, which is no longer admirable. These works brought Tieck into close relationship with A. W. von Schlegel and others, and led to the establishment of the literary sect or esoteric known as the "Romantic school," whose influence on the later literature of Germany and France has been very great, and not always very good. Tieck now married the daughter of a Hamburg clergyman who had been a friend of Lessing; and in 1799 went to Jena, where he added Steffens to the list of his friends. Here he published his famous *Romantische Dichtungen* (2 vols., 1799-1800). His translation of *Don Quixote* (4 vols., Berl. 1799-1801, 3d ed., 1831) far surpassed all previous attempts. In 1802 he joined A. W. von Schlegel in the *Musen-Almanach*; and in 1804 published his longest romance, *Kaiser Octavianus*. Tieck's health now began to fail him, and in 1805 he visited Italy. On his return to Germany, he settled, after some changes, at Ziebingen in 1811, where he formed a friendship with the philosopher Solger, who exercised a great influence over his mind. Henceforth we find less of the dreamy

and formless mysticism of his earlier years, and more of the artistic element. The change becomes visible in his *Phantusius* (3 vols., Berl. 1812-15), and in his *Ulrich's von Lichtenstein Freunddienst* (Tüb. 1815). In 1817, along with a friend, Burgsdorf, he paid a visit to England, where he collected fresh materials for his Shakespeare. From 1819 to 1840 he resided at Dresden; but on the accession to the throne of Friedrich Wilhelm IV. of Prussia, he was invited to Berlin, whither he proceeded, and where he resided for the rest of his life. His death occurred April 28, 1853. Other important works of Tieck's, besides those already mentioned, are his *Norellenkranz* (Berl. 1831-35; complete in 12 vols., Berl. 1853); in which there is hardly a trace of the credulous romanticism of his earlier years, but abundance of lively and subtle talk on the literature and life of the present; *Dramaturgische Blätter* (2 vols., Bresl. 1826), republished in his *Kritische Schriften* (4 vols., Leip. 1848-52); *Shakespeare's Vorschule* (2 vols., Leip. 1823-29); and his splendid continuation of Schlegel's translation of our great poet. Tieck revised a collected but incomplete edition of his works in 20 vols. (Berl. 1828-42).—See Köpke's *Life of Tieck* (2 vols.).

TIEDEMANN, DIETRICH, 1748-1803; b. Germany; educated at the university of Göttingen. He was teacher of ancient languages at Cassel 1776-86, when he was called to the chair of philosophy at Marburg. His most important work is his *Geist der Speculativen Philosophie* (1791-97), containing the history of philosophy from the time of Thales. His other works, such as *Untersuchungen über den Menschen* (1777-98); and *Idealistische Briefe* (1798), contain interesting researches in psychology.

TIEL, the seat of an arrondissement in the Netherlands, province of Gelderland, is picturesquely situated on the right bank of the Waal. In the 5th c. it was called Tellum or Thiela. The fortifications have been demolished, and formed into beautiful walks. Pop. 7,598. Principal buildings are the town-house, court house, chamber of trade, and the great Reformed church of St. Martin.

Tiel has a good haven, and large trade in agricultural produce and cattle. It imports grain, earthenware, wood, lime, coal, bricks, salt, etc.; and exports potatoes, grain, colza, pigs, flax, apples, cherries, etc. Principal industries are copper-founding, brick-making, tanning, book-printing, paper-making, beer-brewing, etc.

TIEN-TE (celestial virtue), the name given to the *Tae-ping-wang* (king of universal peace), the pretender to imperial authority in China, and the head of the mighty insurrection which for 16 years convulsed that country. See CHINESE EMPIRE and TAE-PINGS. The insurrection was under the direction of five chiefs, Hung-sew-tseuen, Hiang-tsew-ting, Siao-tsha-kuei, Fung-hien-san, and Wei-ting, independent of each other, but all acknowledging the supremacy of Tien-te; and as, according to the plan of the rebellion, China, after being delivered from its Manchoo rulers, was to be divided among those chiefs, each of them assumed beforehand the title and insignia of "king." So little reliable were the statements which were forwarded to Europe respecting this insurrection, that for some time Hung-sew-tseuen, the chief among the five kings, and the military leader of the rebels, was confounded with their supreme head.

TIEN-TSIN, a large and important city and river-port of China, in the province of Chih-le, on the right bank of the Pei-ho, 34 miles from the mouth of that river by land, and 68 miles by the windings of the stream. It is the port of the city of Peking, from which it is distant 80 miles south-east. The streets are unpaved, and the houses, principally built of mud or dried bricks, have a mean appearance, though the central parts of the town are filled with well-built houses. The maximum of heat in the summer is 106°, the maximum of cold is 6° below zero. The river is generally frozen over from about Dec. 15 to March 15, and the business, at other times carried on by means of boats and junks, is taken up by sledges, which swarm on the river. By the treaty of Tien-tsin, signed here Nov., 1858, and by the subsequent convention of Peking, Oct., 1860, the port was declared open; and a British consulate was established in Jan., 1861. In 1870, 258 vessels, of 100,223 tons, were engaged in the trade of Tien-tsin; in 1875, the number of vessels was 673, of 350,916 tons. In 1864 the value of the imports amounted to £2,421,050; the exports to £548,082. In 1875 the imports amounted to £4,610,677; the exports to £506,936. There is also a large and rapidly increasing transit trade with Russia *via* Siberia, tea to the value of £906,914 having been forwarded in 1875 from Tien-tsin overland to Russia. The principal articles imported are opium, shirtings, chintzes, and other cotton goods; needles, window-glass, sugar (brown and white), and paper. The chief exports are peas and dates. Pop. reckoned at 1,000,000.—*Reports of Her Majesty's Secretaries of Embassy and Legation* (1866); and *Commercial Reports from Her Majesty's Consuls* (1875).

TIERCE. See FENCING.

TIERCE. **TIERCÉ**, in heraldry, a term of blazon used to indicate that the field is divided by lines into three equal parts. A shield may be tiercé in pale, in fess, in bend, in bend-sinister, or in pall; all which, with other arrangements in tierce, are common in French heraldry. Tierce in pale, in English heraldry, is an occasional mode of marshalling three coats in one escutcheon under special circumstances.

TIERRA DEL FUEGO. See TERRA DEL FUEGO, *ante*.

TIERS ÉTAT (Fr. third estate), the third branch of the French estates, which consisted of representatives of the trading inhabitants of the towns, and of the peasantry in the country. The *tiers état* played an important part in the opening scene of the revolution. On the two other estates of nobles and clergy refusing to join them and deliberate in a common chamber, they, on June 17, 1789, assumed the title of *assemblée nationale*, and the sole right to legislate for France. The French *tiers état* differed completely in its origin from the third estate or commons of England. The latter originated in the permission granted to the minor barons, instead of personally attending the national council, to appear by representatives; and with the representatives of the minor barons were joined in one house the representatives of the municipalities, which, as corporations, came to be considered in the light of tenants *in capite* of the crown. The designation "commons," and the absence of title, have often misled foreigners to suppose that the men who gained their liberties and constitution for the English people were the *roturiers* or *bourgeois*; whereas they mostly belonged to the class which would, in continental phraseology, be called the nobility of the country.

TIETJENS, or **TITIENS**, TERESA, one of the greatest of recent operatic singers. She was born at Hamburg, of Hungarian parents, in 1834, and made her *début* in that city in the character of Lucrezia Borgia in 1849, taking at once a very high position on the lyric stage; at Frankfort and Vienna she was even more warmly received; and her first appearance in London, in 1858, was quite a triumph. The great volume and purity of her voice, and her energetic but dignified acting, combined to make her an unrivaled representative of strong dramatic parts. She acquired great fluency and flexibility of voice by hard practice. She was probably the hardest-worked singer that has appeared; and though this did not seem to injure her voice, it doubtless wore out her constitution. She died Oct. 3, 1877.

TIFFANY, a kind of very thin silk gauze.

TIFFIN, the seat of justice of Seneca co., Ohio, on the Sandusky river, and on the Cincinnati, Sandusky and Cleveland, the Toledo, Tiffin and Eastern, the Mansfield, Coldwater and Lake Michigan, and the Baltimore, Pittsburg and Chicago railroads; pop. '80, 7,875. The city is on level ground; is lighted with gas, and contains Heidelberg college, founded in 1850, with scientific and classical courses; an Ursuline convent; and an orphan asylum. It has manufactories of agricultural implements, steam-engines, shoes, furniture, stoves, and woollens, stone and tile works, and foundries.

TIFFIN, EDWARD, 1766-1829; b. England; came to this country and settled in Charlestown, Va., 1786. He was both physician and Methodist preacher. He removed to Ohio in 1798, and was the first governor of that state, 1803-7; was then appointed to serve an unexpired term in the U. S. senate, 1807-9; was commissioner of the land office, 1812-15, and afterward surveyor-general of the north-western territory. The city of Tiffin was named in his honor.

TIFLIS, a government of the Russian lieutenancy of Caucasasia, lying immediately south of the Caucasus. Area, 15,553 sq. m.; pop. 71,606,584, chiefly Georgians, Armenians, and Tartars. It is traversed by several chains of mountains, which belong either to the Caucasian mountains (the peak of Kazbeck, 17,500 ft. high), and extend over the n. and e. parts of the government, or to the Ararat, Achaltzick, and Alagiz mountains, spreading from the sources of the Kur and Arax over the s. districts. The principal lake, that of Goktcha, is about 50 m. long and nearly 20 m. in extreme breadth. The rivers, the chief of which are the Kur and Arax, rise amid mountains, are very rapid, are confined between high banks, and are not navigable. The climate varies with the varieties of elevation of the surface; the soil, very fertile in some tracts, is not in general cultivated. Grain, tobacco, cotton, indigo, vegetables, and grapes are produced abundantly. Tiflis is rich in mineral springs and in timber, the principal trees being the oak, elm, chestnut, and maple. The Christian and Mohammedan are the predominant creeds.

TIFLIS, an important Russian city, capital of the government of the same name and of the territory of the Caucasus (and s. of the mountain range of that name), stands on both banks of the Kur, 165 m.—direct line—e.s.e. of the Black sea. There are several manufactories, in which woolen and linen cloths, carpets, and arms are made. Tiflis was formerly a fortress, and the capital of the district of Georgia. It carries on an active trade with Persia, and is the great emporium of the Russian territory s. of the Caucasus. In the vicinity are naphtha springs as well as thermal springs, which are much visited. Tiflis was founded in the 4th c., and annexed to Russia in 1802. Pop. '73, 70,591, mostly Armenians.

TIGER, *Felis tigris*, one of the largest of the *felidæ*, equal perhaps to the lion in size and strength, and superior in activity. It has no trace of mane. It is more slender than the lion, its whole form more cat-like, its head smaller and rounder. All its motions are performed with the utmost grace and apparent ease. It does not climb trees, but winds its way through brushwood or jungle with great dexterity, runs very swiftly, and can leap an immense distance. It takes its prey either by running, or, more frequently, by lying in ambush and leaping upon it. Its strength is such that it is capable of carrying off an ox or buffalo. It is sometimes 15 ft. in entire length to the tip of the tail; an

instance is on record of 18 feet; the height is from 3 to 4 feet. The tigers of some regions differ considerably in size from those of others; thus the tiger of Bengal is much larger than that of Bokhara. The hair is thick, fine, and shining; in the colder countries which the tiger inhabits, it is thicker and longer than in tropical regions. The color is a bright tawny yellow, beautifully marked with dark transverse bands, passing into pure white on the under parts; the dark bands are continued as rings on the tail. The tail is long, slightly tapering, clothed with hair similar to that of the body. Individuals sometimes occur, of a pale whitish color, obscurely striped, the stripes only visible in particular lights. The tiger is found only in Asia. It abounds in Hindustan, in the Eastern Peninsula, in Java, Sumatra, and other tropical islands. It is found also in China and Japan, and in Persia. Its range, however, does not extend much to the west of a line drawn from the mouth of the Indus to the Caspian sea. It is found as far n. as the s. of Siberia, and even on the banks of the Obi. It inhabits woods, and cannot exist without free access to water. The islands of the delta of the Ganges have long been celebrated as a haunt of tigers. The tigers generally lie concealed in a thicket during the day, and seek its prey by night. The prey is very often obtained by watching near the places to which animals resort for the purpose of drinking. Tigers prowl about villages, and enter cattle-folds; they also follow traveling-parties, and seize the yoke-oxen and buffaloes, particularly those which straggle away from the encampment at night. The ravages of tigers in some parts of the East Indies are very great; and a great number of human beings are destroyed by them. A notion prevails that a tiger which has once tasted human flesh becomes eager for it, and prefers it to all other food; and a single tiger has been known to kill and devour many people, watching near some frequented path, or prowling around a village. The truth appears to be that this is the mode of obtaining prey to which a tiger sometimes resorts, when incapable, through old age, of the active exertion necessary for capturing buffaloes or deer. The tiger brings forth three, four, or five young ones at a birth. When taken young, it is easily tamed, and often shows much affection for those who treat it with kindness. Tame tigers are not unfrequently to be seen in India.

The tiger was less familiarly known to the ancients than the large African *felideæ*. It is, however, mentioned by Aristotle, and it is frequently mentioned by the Latin poets. Pliny tells us that the first tiger seen at Rome was a tame one belonging to Augustus. Claudius exhibited four tigers at once.

The tiger frequently breeds in captivity, but not so frequently as the lion. A hybrid between the lion and tiger, the offspring of the male lion and the tigress, has been sometimes produced in menageries. It is striped like the tiger, and not maned. None of the hybrid cubs, however, have lived long.

Tiger hunting is a favorite Indian sport, not unattended with danger, but all the more exciting on that account. Europeans generally ride on elephants when engaged in it, and the tiger is shot from the back of the elephant. Natives, however, are employed to beat the wood or jungle for the tiger, and lives are not unfrequently lost; but the destruction of a single tiger is sometimes a thing of importance to a whole village or neighborhood. The East India company formerly gave a reward of ten rupees for every tiger killed. In most parts of India, tigers are now much less numerous than they once were. Many expeditions, of which the following are the chief, are adopted for their destruction in the countries infested by them. Bows with poisoned arrows are fixed in their paths, so as to be discharged on being touched. Heavy beams are also so placed as to fall upon the tiger pressing against a rope, and crush it by their weight. Traps of various kinds are set, sometimes baited with a live goat or other small animal. The Chinese use a box-trap with a looking glass placed in it, and the tiger, attracted by his own image, disengages the fastening of the lid, and is captured. This method is very ancient, and is represented in ancient sculpture. A very curious mode, practiced in Oude, consists in scattering numbers of broad leaves smeared with a substance like bird-lime in the tiger's path, and if he sets foot on a smeared leaf, his fate may be regarded as sealed. He rubs his paw on his face, to get quit of the leaf, and the case becomes worse, the leaves are transferred to his face; fresh attempts to remove the nuisance only add more leaves, till he becomes completely blinded, and rolls on the ground for very rage; while the hunters, ambushed close by, apprized by his howlings, hasten to dispatch him.

The tiger is an emblem of power in the east. A tiger's head, gorgeously adorned with jewels, decorated the throne of Hyder Ali and Tippoo Sahib, and was among the spoils taken by the British at Seringapatam.

TIGER BEETLE, a name given to some of the species of the genus *cicindela*, of the family *cicindelideæ*, of the order coleoptera. This family comprises brilliant-colored beetles with large head and globose eyes, long antennæ, and very long, toothed mandibles. They inhabit warm sandy places, especially by the banks of streams, and are exceedingly carnivorous and voracious. The principal species are contained in the genus *cicindela*.

The common tiger-beetle, *c. vulgaris* of Say, is very swift in its movements, and difficult to capture. It lives in holes near the borders of water where it lies in wait for its prey. Another species is the hairy-necked tiger-beetle, *c. hirticollis* of Say. See *CICINDELA*, ante.

TIGER-CAT, a name often given to some of the *felidæ* of middling size, which resemble the tiger in their form or markings. The ocelots (q.v.) and the serval (q.v.) sometimes receive this name, which, however, is not of very definite signification. The *CHATI* (*felis mitis*) is a tiger-cat of South America, rather more than two ft. in length, exclusive of the tail, which is about eleven inches. The color is yellowish, with irregular dark patches, those on the back forming four longitudinal rows; the markings indeed, more leopard-like than tiger-like. The chati prowls by night, and often carries away poultry from their roosting-places. Almost all tropical and subtropical countries have their tiger-cats. Several species are found in the East Indies.

TIGER-FLOWER, *Tigridia pannonia*, a plant of the natural order *iridacæ*, the only known species of its genus, which is distinguished by the three outer segments of the perianth being larger, and by the filaments being united into a long cylinder. It is a native of Mexico, but hardly enough to endure the climate of Britain, and much cultivated in flower-gardens for the singularity and great beauty of its flowers, which are, however, very evanescent. The root is a scaly bulb.

TIGRANES, THE GREAT, King of Armenia, B.C. 96-55; descendant of Artases, son-in-law and ally of Mithradates. He conquered Armenia Minor, Cappadocia and Syria, the whole of N. Mesopotamia, and large possessions E. of the middle Tigris. His capital was Tigranocerta between the Tigris and lake Van. He lost all these conquests after the defeat of Mithradates. Lucullus, the Roman commander, invaded Armenia, and defeated near the capital the numerous army of Tigranes during the absence of Mithradates, and again near Artaxata. The treaty, concluded B.C. 63, left him only Armenia for which he paid to Pompey an enormous sum. His eldest son Tigranes involved him in many difficulties and bloody wars. His son Artavasdes succeeded him.

TIGRÉ, a state in Abyssinia, lat. 12° to 16° N., lon. 37° 25' to 40° E.; drained by Mareb and Tacazze rivers. It is an elevated plateau varying from 3,500 to 9,000 ft. in height, having deep ravines, through which the rivers run; and is divided into a number of small districts. The chief towns are Antato, Axum, and Adowa, the capital, which is an entrepot for the caravan route of Massowah and Gondar. It was conquered by Theodore, king of Abyssinia, in 1855, previous to which it was an independent kingdom.

TIGRIS (Heb. *Ḥiddēkel*; i.e., the "Dekel," equivalent to *Digla* or *Diglath*, probably a Semitic corruption of *tigra*, Medo-Persic for an arrow; hence Gr. *Tigris*, the "arrowy" stream), a large river of Asiatic Turkey, rises S. of lake Göljik, in the mountains of Kurdistan, within a few m. of the eastern bend of the Euphrates (q.v.), flows S.E. to Diarbekir, after which it makes a sharp turn, and flows due E. for 100 m. to Til. Here it receives from the north a considerable affluent, the Bitlis, and once more altering its course, runs in a south-easterly direction through desert wastes and unpeopled pastures, until it falls into the Persian gulf, after a course estimated at 1150 miles. Its chief tributaries, besides the Bitlis, are the Great and Little Zab, and the Dyala, all from the left, the waste land between it and the Euphrates (ancient Mesopotamia) not furnishing a single stream. At Kurna it joins the Euphrates, 90 m. above the mouth of that river in the Persian gulf, and henceforth the united rivers bear the name of Shat-el-Arab (see *ΕΥΦΡΑΤΗΣ*). In the upper part of its course, the Tigris is a very swift stream, whence probably its name, and it brings down great quantities of mud. The principal places on its banks are Diarbekir, Mosul, and Bagdad, with the ruins of Nineveh, Seleucia, and Ctesiphon.

TILBURG, a flourishing trading and manufacturing t. in the Netherlands, province of North Brabant, is 15 m. S.W. from 's-Hertogenbosch, and 14 E.S.E. of Breda. In 1874, pop. 24,747, having more than doubled in 50 years. This prosperity began with king William II., when prince of Orange, and commander of the army, taking up his headquarters at Tilburg, during the long contest which ended in the independence of Belgium. Much heath has been converted into arable and pasture lands, and numerous brick-works and woolen-cloth factories have arisen. In 1847 there were 13 wool-spinning works with steam-power; they now number 37, and the workers have increased from 2,900 to 5,000. The workmen's houses have each a strip of land attached, for the growth of vegetables and potatoes. Weaving woolen cloth, spinning, finishing and dyeing woolen fabrics, making soap, salt, tiles, bricks, and beer, are the principal industries. The chief buildings are the new palace, the town-house, the barracks, and the cloth-hall. Tilburg has a high school with a course of five years, a drawing-school, and several charitable institutions. The people are nearly all Roman Catholics. The town is mentioned as early as 709.

TILBURY FORT, in Essex, is situated on the N. bank of the Thames, opposite to Gravesend. Originally erected in the time of Henry VIII. as a block-house, it was converted (1667) into a regular fortification after the bold expedition of De Ruyter into the Thames and Medway. It is of a rectangular form, built chiefly of brick, with a massive stone portal, and is surrounded by a deep and wide fosse, which can easily be filled with water. Batteries of heavy ordnance are placed so as to command the river and the reach below; there are also piers for the landing of troops, stores, etc. The banks of the Thames being here very flat, the ground around the fort is during floods

and high tides laid under water, and the atmosphere of the place is in consequence far from salubrious.

TILDEN, SAMUEL JONES, b. N. Y., 1814; graduated at Yale college; and having studied law in the university of New York, was admitted to the bar of the metropolis. He achieved a reputation for great legal skill, particularly in railroad litigation. Having interested himself in local and state politics, he was made chairman of the democratic state committee of New York, a position which he held for thirteen years. In 1846, and again in 1872, he was a member of the state assembly; and in 1874 was elected governor of the state by the democratic party. In June, 1876, he was nominated, by the democratic national convention at St. Louis, the candidate of the party for the presidency. At the election in November, Mr. Tilden received a majority of the popular vote, but the vote in the states of Louisiana, South Carolina, Oregon, and Florida being disputed, great popular excitement ensued, and the two political parties were forced to agree upon a compromise. A commission was appointed (see ELECTORAL COMMISSION), of 5 senators, 5 judges of the supreme court of the United States, and 5 representatives. This commission divided on party lines, and voted 8 republican to 7 democratic; and by their decision the disputed votes were given to Rutherford B. Hayes, the opposing candidate, who was declared elected president by a majority of one electoral vote. In 1880 Mr. Tilden was again in question for the democratic nomination for president, but declined it in a letter read before the democratic national convention at Cincinnati. Since that period he has lived in retirement.

TILES (Lat. *tegula*, from *teg-*, to cover; Fr. *tuile*), plates of baked clay, of various shapes, according to their use, some being for roofs, some for pavements. The finer kinds of paving-tiles are known as encaustic tiles (q.v.). The small cubical pieces of burnt clay, stone, glass, or other material used for mosaic pavements are called tesserae (Gr. *tessares*, four). See MOSAIC. Besides ornamental tiles, much improvement has been lately effected by various manufacturers in the different kinds used for roofing purposes, especially by the use of fire-clay, by which a tile is made not only greatly superior in strength and durability, but also in sharpness of form and diminution of the thickness. Ridge-tiles of a very ornamental character are also largely made. Drain-tiles have been described under the head of PIPES.

TILE STONES, the uppermost group of the silurian period, consisting of a reddish, thin-bedded, slightly micaceous sandstone, which in some places attains a thickness of 100 feet. The beds were originally considered as of old red sandstone age; then they were regarded as a transition group, forming a passage from the silurian strata to the old red sandstone; but it is now ascertained that the fossils agree in great part specifically, and in general character entirely, with those of the underlying upper Ludlow rocks, and they are accordingly considered to be the newest group of the upper silurian division. The tilestones are well seen at Kington in Herefordshire, and at Downton castle, near Ludlow, where they are quarried for building purposes. From the latter locality they have received the name of the Downton sandstones.

TILGHMAN, TENCH, 1744-86; b. Easton, Md.; son of James and brother of judge William; was a merchant in 1776; was appointed private secretary and aid-de-camp to gen. Washington, and served in that capacity throughout the revolutionary war, with the rank of lieutenant-col. He was the bearer to congress of the news of the surrender of Cornwallis, and received a vote of thanks. His record, indorsed by Washington, is that of a brave soldier, who had been "in every action in which the army was concerned," and "a faithful assistant to him for nearly 5 years," a great part of which was gratuitous service.

TILIA CEE, a natural order of exogenous plants, of which nearly 400 species are known, mostly trees and shrubs, with a few herbaceous plants. They are mostly natives of the tropics. A few are found in the temperate parts of the northern hemisphere. They have simple, alternate leaves, with stipules, and axillary flowers. The calyx is usually of four or five sepals; the corolla, of four or five petals. The corolla is sometimes wanting. The stamens are generally numerous, hypogynous, distinct; the outer ones sometimes abortive and petal-like. The ovary is composed of 2-10 carpels; there is one style, and the stigmas are equal in number to the carpels. As the characters somewhat correspond with those of *malvaceae*, so do the properties of the order, which are generally mucilaginous and wholesome, the bark fibrous. Some yield a light and useful timber, as the lime (q.v.) or linden tree, a well-known European representative of the order, the halimilille (q.v.) of Ceylon, the *grewia elastica* of India, and the *tuchia dicaricata* of Brazil. The bast of the lime-tree is valuable from its fibrous character; that of the species of *grewia* is used in the same way in India, and that of all the species of *apeiba* in South America. The most important fibrous plants of the order, however, are the species of *corchorus* (q.v.), which yield jute (q.v.).

TILL, a term employed, chiefly in Scotland, for the boulder-clay (q.v.). See also PLEISTOCENE.

TILLAMOOK, a co. in n.w. Oregon, on the Pacific ocean; about 1350 sq. m.; pop. '80, 970-860 of American birth. The surface is mostly woodland. There is good pasture

land along the streams. Iron and coal are found. The principal productions are butter, wheat, oats, and live stock. Co. seat, Tillamook.

TILLANDSIA. See **BROMELLACEÆ**.

TILLEMONT, SEBASTIAN LE NAIN DE, the well-known ecclesiastical historian, was born at Paris, Nov. 30, 1637. His father was Jean le Nain, who held the office of *Maître des Requêtes*, the title, De Tillemont, by which the historian is commonly known, being derived from a small estate near Vincennes, which belonged to his family. He was educated at Port Royal, where he early imbibed those serious and rigorous views of the spiritual life which characterized the members of that celebrated society. His theological studies were marked from the first by a spirit of inquiry into the writings of the fathers; and he is said to have begun as a student those analyses of the works of the fathers, especially of the apostolic fathers, which form the staple of the early volumes of his history. Naturally of a timidly scrupulous disposition, he hesitated long about the choice of a profession; but after various changes of life, he at last received sub-deacon's orders in 1672, being then 35. He deferred his ordination as deacon till the end of 1673; nor was it till 1676 that he was ordained a priest, mainly at the persuasion of his friend, Le Maître de Saëy, who had long been his spiritual adviser, and with whose attachment to the Jansenistic principles he sympathized at least to a certain extent. In 1679, Tillemont took up his residence at his family estate of Tillemont, where he resided till 1681. In that year he made a visit to Holland and the low countries, for the purpose of visiting Arnauld and the other Jansenist refugees. He was induced, in the following year, to undertake a parochial charge—that of St. Lambert; but he held it only for a short time.

During these years, he had steadily pursued the historical studies which he had commenced almost during his school-days; and he had now prepared the first portion of his long-projected work on the history of the church. He was induced, on the very eve of printing, to change the plan of the work. In order to avoid the opposition of the censor, to whom, as a theological work, it would have been necessary to submit it in its first form, and whose suspicions were aroused by the known association of Tillemont with the Jansenist party, Tillemont separated from the church history the history of the emperors, which he was enabled to print as a distinct work, without referring it to the censorship, under the title *Histoire des Empereurs* (6 vols. 4to, 1690). The success of this work disarmed the opposition of the church authorities. The hostile censor was replaced by a less exacting one; and eventually, in 1693, the first volume of the church history appeared under the title *Mémoires pour servir à l'Histoire Ecclésiastique des six Premiers Siècles* (16 vols. 4to). Neither of these works, however, was completed during the author's lifetime. Only 4 out of the 6 volumes of the *Emperors*, and 4 out of the 16 of the *Histoire Ecclésiastique*, were printed under his own care. The remaining volumes were completed by him, but did not appear till after his death. The *Emperors* comprises all the reigns from Augustus to Anastasius (518); the *Histoire Ecclésiastique* comes down to about the same period. The plan of both is very much the same, being in great part a compilation of the original writers, as far as possible in their own words, but arranged with great skill and judgment, and linked together by such explanations and such a chain of narrative (within brackets) as is necessary to render them intelligible, and to carry on the course of events in a connected recital. Both these works have maintained, even to this day, their reputation for learning and impartiality; and even in the acrimonious contest of the 17th c., there was but little impeachment of Tillemont's orthodoxy, so far as the histories are concerned. His other writings, left in manuscript, were for the most part used as materials by later compilers. Some of his letters have been appended to his *Life*, published by his friend Tronchet, canon of Laval (Cologne, 1711). Tillemont died at Paris, Jan. 10, 1698, having just entered upon his 61st year. The extent and accuracy of his erudition are still freely acknowledged, and his authorities have supplied the materials of most of the church histories compiled since his time.

TILLER. See **HELM**.

TILLICOUNTRY, a manufacturing t. of Scotland, beautifully situated in the county of Clackmannan, on the Devon, 9 m. e.n.e. of Stirling, with which it is connected by railway. There are large manufactures of shawls and plaidings. Pop. '71 3,745

TILLOTSON, JOHN, Archbishop of Canterbury, was the son of a clothier, and was born at Sowerby, in Yorkshire, in 1630. His father, Mr. Robert Tillotson, was a zealous puritan—a circumstance that is not a little curious, when we consider that the son ultimately turned out the most catholic churchman of his age. Tillotson studied at Clare Hall, Cambridge, where he took the degree of B.A. in 1650, and of M.A. in 1654. The writings of Chillingworth are said to have exercised a powerful influence on his mind during his university curriculum; but he owed not less to his friendly intercourse with Cudworth, More, Rust, Smith, Wilkins, and other eminent scholars. In 1656, he became private tutor in the house of Edmund Prideaux of Ford Abbey, Devonshire, attorney-general under the protector, but appears to have returned to London shortly before Cromwell's death. At what time Tillotson entered into orders, or who ordained him, is not known, but he was a preacher in 1661—attached apparently to the Presbyterian party in the church of England, for at the famous Savoy conference (q.v.) he was

present on the Presbyterian side; but he submitted at once to the act of uniformity (1662); and in December of that year, was offered the church of St. Mary Aldermanbury, London, of which Edmund Calamy had been deprived; but declined it. In 1663, he was appointed to the rectory of Keddington in Suffolk; but almost immediately after, was chosen preacher at Lincoln's Inn, where his mild, evangelical, but *undoctinal* morality was at first little relished. "Since Mr. Tillotson came," said the benchers, "Jesus Christ has not been preached among us." However, as the graces of his character gradually displayed themselves, his popularity increased, especially when it was found, that although not a puritan, he was nevertheless averse to atheism and popery. In 1664, he published a sermon *On the Wisdom of being Religious*; and in 1666, *The Rule of Faith*, in reply to a work by an English clergyman named Sargeant, who had gone over to the church of Rome. About the same period, he took the degree of D.D.; and in 1670, was made a prebend of Canterbury. Two years later, he was promoted to a deanery; and in 1680, published a somewhat notable sermon entitled *The Protestant Religion vindicated from the Charge of Singularity and Novelty*, in which he advanced the proposition, untenable by a Protestant, that "no man is at liberty to affront (i. e., to attack) the established religion of a nation, though it be false." This proposition he subsequently, on reflection, abandoned. Along with Burnet, he attended lord Russell during his imprisonment for complicity in the Rye-house plot; and on the accession of William III., rose high into favor. In 1689, he was appointed clerk of the closet to the king; and in April, 1691, was raised to the see of Canterbury, vacant by the deposition of Sancroft (q.v.), after vainly imploring William to spare him an honor which he foreboded would bring him no peace. Nor was he mistaken in his painful presentiment. The non-juring party pursued him with unrelenting rage to the end of his life; but their animosity could not extract one murmur of complaint, or one vindictive retaliation from the meek, humane, and tolerant primate. He did not long enjoy his dignity, dying of palsy, Nov. 18, 1694, at the age of 65. A collected edition of his *Sermons* was published after his death by his chaplain, Dr. Barker; and has been frequently reprinted. They were translated into German by Mosheim; and were long highly popular on account of their clear, solid, and refined thought, their easy eloquence, and their humane and moral piety. Tillotson's life was written by Dr. T. Birch (Lond. 1752).

TILLY, JOHN TZERCLAS, Count of, one of the greatest captains of the 17th c., was born in 1559, at the château of Tilly in Brabant. A pupil of the Jesuits, his natural sternness of character inclined him to embrace their fanatical ideas; and this bent of mind was fixed by the examples of Alba (q.v.) and Requesens, under whom he was initiated into the art of war in the low countries. After a term of distinguished service in Hungary against the Turks, he was appointed (1609) by duke Maximilian of Bavaria to re-organize his army, but resigned this post to take the command of the Catholic army at the outbreak of the Thirty Years' war (q.v.), and in conjunction with duke Maximilian gained (Nov. 8, 1620) the battle of Prague, which dissipated the ambitious dreams of the elector-palatine. During the course of this war, he separated, by able strategy, the armies of Mansfeld and of the markgraf of Baden, beat the latter at Wimpfen, expelled Christian of Brunswick from the Palatinate (1622), defeating him at Höchst (July 22, 1622) and at Stadion (Aug. 1623); the latter conflict, which was of the most desperate character, lasting for three days. Created a count of the empire, he was next opposed to the king of Denmark, whom he conquered at Lutter (Aug. 17, 1626), and in conjunction with Wallenstein, compelled to sign the shameful treaty of Lübeck (1629). In the following year, he succeeded Wallenstein as commander-in-chief of the imperial forces, and took by storm the town of Magdeburg (May 10, 1631). The unheard-of atrocities which he allowed the Croats and Walloons of his army to perpetrate on this occasion have affixed to his otherwise high reputation a foul blot, ineffaceable by all the cosmetic arts of his numerous apologists. On May 14, he made a solemn entry into the ruined city, attended the celebration of a *Te Deum* in the cathedral, and then sent to the emperor a dispatch in which occurs this remarkable passage: "Since the capture of Troy, and the destruction of Jerusalem, a victory such as this has never been seen!" From this time, however, fortune deserted him; for his next opponent was the great Gustavus Adolphus, who completely routed him at Breitenfeld (Sept. 17, 1631); and though, in the following spring, he obtained some minor successes over the Swedish gen. Horn, the king speedily forced him to retreat behind the Lech in Bavaria, and (April 5) forced the passage of the river right in his front, after a desperate conflict in which Tilly was mortally wounded. He was removed to Ingolstadt, where he died, April 30, 1632. Tilly, the victor in 36 battles, was reckoned the best general of the time till his defeat by the Swedes; he was small in stature, and of a meager habit of body, with a stern and energetic cast of countenance. Sober and continent, a despiser of luxury and wealth, his zealous support of the Catholic party was entirely founded upon fanatical zeal for the supremacy of a religion which he regarded with more than monkish devotion.

TIL-SEED. See SESAMUM.

TILSIT, a t. of Prussia, in the province of Prussia, on the left bank of the Memel or Niemen, 65 m. n.e. of Königsberg. Pop. '75, 19,787. It stands in a fruitful district, called the Tilsit Flat, has broad streets and a cleanly appearance. Its castle and town-hall are the chief buildings. It carries on an active transit-trade with Russia,

besides considerable trade in timber, corn, butter, cheese, and Russian products, and has paper, sugar, and oil-mills. Tilsit will be ever memorable in history for the treaties which were there signed between France and Russia on July 7, and France and Prussia on July 9, 1807. By the former of these, Napoleon agreed to restore to the king of Prussia a great portion of his dominions, his Polish acquisitions being joined to Saxony (see POLAND), and his possessions west of the Elbe formed into the nucleus of the new kingdom of Westphalia; Dantzic was declared an independent city; the Prussian province of Bialystok was ceded to Russia; the dukes of Oldenburg and Mecklenburg, the czar's relatives, were reinstated by Napoleon, and in return, the Bonapartist kings of Naples and Holland were recognized by the czar, etc. By the latter, the king of Prussia recognized the kings of Holland, Naples, and Westphalia, and the Confederation of the Rhine, agreed to the cessions laid down in the Russian treaty, and to other minor alienations and concessions to Saxony, amounting in all to nearly one half of his dominions: to the exclusion from his harbors of the commerce of Great Britain, and to the occupation of the Prussian fortresses by the French, till the payment of an enormous ransom. The weighty importance of the alterations effected by this treaty is, however, dwarfed before the startling magnitude of the *secret provisions* signed between France and Russia. By these were arranged the resignation of the empire of the east to Russia, Roumelia and Constantinople being specially excepted by Napoleon, and the acquisition of the Spanish peninsula by France; the two powers were to make common cause against Great Britain, and were to force the three courts of Stockholm, Copenhagen, and Lisbon to join them; and Napoleon agreed to increase no further the power of the duchy of Warsaw, and to do nothing which might lead to the re-establishment of the Polish monarchy. By a further agreement, not put formally into writing, the mouths of the Cattaro, the Ionian isles, Sicily, Malta, Egypt, and the papal dominions were to be taken by France; and Greece, Macedonia, Dalmatia, and the Adriatic coasts, on the partition of Turkey; while, on the other hand, Russia was to obtain the rest of Turkey, and was allowed to seize Finland. These secret articles are given on most excellent authority, and their correctness is further vouched for by the conduct of France and Russia for the next few years.

TILTON, JAMES, 1745-1822: b. Del.; educated at the Philadelphia medical school. As surgeon of a Delaware regiment he was at the battles of Long Island and White Plains; and he was hospital-surgeon, 1777-83, when he resumed practice, at Dover, Del. He was often a member of the legislature; sat in the continental congress, 1783-85; and was loan commissioner, 1785-1801. In 1812 he became U. S. surgeon-gen. He published *Economical Observations on Military Hospitals* (1813).

TILTON, THEODORE, b. N. Y., 1825; educated at the N. Y. free academy; became connected with the N. Y. *Independent*, in 1856, and was its editor for many years. He was editor of the *Brooklyn Union*, 1871-2, when he founded the *Golden Age*, of which he was editor till 1874. In the latter year he sued rev. H. W. Beecher, for alleged seduction of his wife, but the jury after a trial of six months disagreed. Among his works are: *The King's Ring*, 1866; and *The Sexton's Tale* (1867), poems; and *Tempest Tossed*, a novel (1875). He is a public lecturer of some reputation.

TIMBER, a general term applied to all wood used for purposes of construction. Most of these have been described under their respective names; but the following tabular statement will show the value of some of the leading sorts of colonial timber which are now beginning to be imported into Britain:

Name.	Colony whence imported.	Breaking Strain of Specimens two in. sq. by twelve in. long.	Specific Gravity.
		lbs.	
Iron-wood.....	Jamaica	14,991.2	
Greenheart.....	B. Guiana	12,215.6	1.089
Hickory.....	N. S. Wales	7,795.4	
Mora.....	B. Guiana	9,700.2	0.922
Water-gum.....	N. S. Wales	7,760.1	
Blue-gum.....	N. S. Wales	7,167.1	0.843
Bully tree.....	Jamaica	6,721.0	
Purple-heart.....	B. Guiana	6,393.3	
Locust tree.....	B. Guiana	6,082.7	
Stringy-bark.....	N. S. Wales	5,795.9	
Cedar.....	Jamaica	3,196.7	
Yacca.....	Jamaica	2,304.6	

The trade in timber is, of course, very extensive. Besides that grown in Great Britain, there is annually imported from the colonies and foreign countries an enormous quantity. Of fir, the imports of 1865 were 4,014,655 loads, of which rather more than one-half was from the North American colonies, and the remainder from foreign countries. In 1877 the total quantity of all kinds of timber imported was 6,788,779 loads, the load being 50 cubic feet. There were besides 90,720 tons of mahogany and other hard wood, and the total value of the whole amounted to the sum of £20,628,424.

TIMBER, in point of English law, when growing on land, belongs to the owner of the land; or in case of a lease, to the landlord. In the case of a life-estate in the lands, the tenant for life, unless restrained by covenant or agreement, is entitled to estovers or botes; i.e., wood necessary to repair or burn in the house, and to repair hedges and fences. But the tenant for life cannot commit voluntary waste by felling trees. If the timber is in such an advanced state that it would be injured by standing longer, the court of chancery has power to grant leave to sell it, in which event the principal of the price will belong to the reversioner, and the interest thereof to the tenant for life. If, however, the estate for life is declared to be given without impeachment of waste (q.v.), as is often the case, then the tenant for life may cut timber to a certain extent with impunity. The tenant for life is entitled to all timber that is blown down on the estate. With regard to ordinary tenants or lessees of lands, though the timber is part of the inheritance, and belongs to the landlord, yet the tenant may cut down the underwood, and take sufficient estovers, or wood, to do repairs. Timber is also protected against third parties who steal or injure it. Thus, whoever steals, cuts, breaks, or damages trees with intent to steal them, provided the injury exceed 1 shilling in value, incurs a penalty of £5; and on repeating the offense, imprisonment may be added; so whoever unlawfully and maliciously cuts, breaks, barks, or otherwise destroys trees to the value of 1 shilling and upward, forfeits £5, or may be imprisoned, in addition to, or as a substitute for such payment, with increased punishment for repeated offenses of the same description.

TIMBERS of a ship are the upright ribs, based on the keel, and rising to the gunwale, on which the planking is fastened. See SHIP-BUILDING.

TIMBER TREES. Trees valuable for their timber are very numerous, and are found in all the warm and temperate parts of the world, except where the aridity of the soil, or the sea-breeze, prevents their growth. They belong to very many and widely different natural orders, all of which, however, are orders of phanerogamous plants; the only cryptogamous plants which assume the form of trees being the tree ferns (q.v.), none of which yield valuable timber. Of endogenous plants none have any claim to be mentioned among timber trees, except some of the palms (q.v.); the only other endogens, indeed, which can be called trees being a very few of the *Ulinaceæ*, as the dragon tree. See DRAGON'S BLOOD. Of gymnogens, the *coniferae* are in general of some value for their timber, and some of them are among the most useful of all timber trees, as the different kinds of fir and pine. A far greater number of timber trees, however, are true exogens, as the oak, ash, elm, beech, sycamore, etc., among British trees; the chestnut and walnut among those of the south of Europe; the mahogany, teak, etc., among those of tropical countries. It is impossible, within our space, to attempt an enumeration. Notice is taken of the most valuable timber trees of different countries in the articles on these countries; of those belonging to particular natural orders, in the articles on these orders; and the most valuable kinds are noticed in separate articles. For the cultivation of timber trees, see the article ARBORICULTURE. Some trees of comparatively small size are valuable on account of the quality of their timber, which is used for veneration or for turnery. Some trees, chiefly valuable as fruit trees, may also be reckoned among timber trees, although not of great importance, of which the apple tree may be mentioned as an instance.

TIMBREL (Spanish *tamburil*), a small musical instrument of the drum species, in use in ancient times, which was carried in the hand, and was apparently not unlike the modern tambourine (q.v.), with or without bells.

TIMBS, JOHN, 1801-75; b. England; edited the *Mirror*, 1827-38; the *Literary World*, 1839-40; and the *Illustrated London News*, 1842-58. He was an industrious compiler, among whose numerous works may be mentioned: *Knowledge for the People* (1831-32); *Things not Generally Known* (1856-57); *Anecdotic Biography* (1859-60); *Lives of Wits and Humorists* (1862); *Club Life of London* (1865); *English Eccentrics and Eccentricities* (1866); and *Notabilia* (1872).

TIMBUC TOO, TOMBOUCTO, or TIMBUKTU, a famous city of Sudan, occupies a position of the highest commercial importance on the great north-western bend of the Niger; lat. 17° 37' n., long. 3° 5' west. It stands only a few feet above the level of the Niger, and at a distance of about six m. from the principal branch of that river, is triangular in shape, is from 2½ to 3 m. in circumference, and at present without walls, though in former times it covered a much greater area, and was defended by walls. It laid out mostly in straight, but partly in winding streets of hard sand and gravel, and having a sort of gutter in the middle. There are three chief squares. There are about 980 clay houses—some low and uselessly, and others rising to two stories and exhibiting considerable architectural adornment—and about 200 huts of matting, almost all in good repair. In the n. of the city is the mosque of Sankoré, an edifice of great grandeur, and which imparts an imposing character to the whole district in which it stands; and the other chief buildings are the "Great Mosque," an immense edifice of stately appearance, 286 ft. in length, by 212 ft. in width; and a few other mosques. The climate is not considered very healthy. Timbuctoo is not a manufacturing town, almost the whole life of the city being based upon foreign commerce, for which its situation renders it the

most favored center. The quantity of corn raised here is much too small to supply local consumption, and almost all the victuals used are imported by water-carriage from Sansanding on the upper Niger. The only manufactures carried on are blacksmiths' work, and articles in leather, especially luggage-bags, cushions, tobacco-pouches, and gun-covers. Most of the clothing sold here is imported from Kano, Sansanding, and England. There are three great highways for foreign commerce to the city of Timbuctoo—down the river from the s.w., and by two roads from the n., from Morocco and Ghadames respectively. Of this commerce, gold, which arrives at this place chiefly in the form of rings, is the staple; and the amount which the city exports is set down at about £20,000 yearly. Salt, and the kola-nut, which is used in place of coffee (see TEA), are also largely imported and re-exported, as are also tobacco and dates. Rice and corn are brought from Sansanding; English manufactures, consisting of red cloth, sashes, looking-glasses, cutlery, and calico, arrive from the n. and north-west. The regular pop. of Timbuctoo is 13,000; with floating pop., during the months of the greatest traffic and intercourse, from 18,000 to 23,000.

Timbuctoo was founded about the end of the 11th c., and first became known to Europeans in 1373. Barth's *Travels in Central Africa*, 1858.

TIME, in music, is used in three different senses: 1. The relative duration of musical sounds as measured by the rhythmical proportion of the different notes, a minim being half of a semibreve; a crotchet, half of a minim; a quaver, half of a crotchet, etc. 2. The division into measures or bars, and the division of each measure into equal parts, and subdivision of these parts; the different combinations of sounds into equal measures and values being said to form different kinds of time, each indicated by a distinct rhythmical signature. 3. The degree of movement—that is, the absolute, and not relative velocity, which is now more generally expressed by the Italian word *tempo*. For time in the first two senses, see RHYTHM; in the third sense, TEMPO.

TIME, RECKONING OF. SEE INTERNATIONAL DATE LINE.

TIME SIGNALS, established in many important cities of England and the United States for the purpose of transmitting standard time by the telegraph. The first use of the system was in 1852, by Mr. C. V. Walker, the English royal astronomer. There are now in the United States, observatories which perform this service, in Washington, Allegheny, Albany, Cincinnati, Chicago, Cambridge, and New Haven. The method now employed is known as the Jones system. In it the clock which furnishes the standard is placed in the same electrical current with those to be controlled. In the clock to be regulated is a helix, which alternately encircles two magnets attached to the pendulum, which are alternately attracted and repelled by the helix. In New York and Boston the time of exact noon is indicated by dropping a ball from the flag poles of conspicuous buildings by means of the electric current.

TIMES, THE, is the largest and most important daily newspaper in England and in the world. It was founded toward the end of the last century by Mr. John Walter, a London printer. In January, 1785, he established *The Daily Universal Register*, which he continued to publish until January, 1788, when he changed the name to *The Times*, or *Daily Universal Register*, afterward shortened to *The Times*. The publication, until the close of the century, remained undistinguished by any extraordinary merit or success. But in 1803, a son of Mr. Walter, also named John, became joint-proprietor and sole manager; and under his guidance it soon became remarkable for the accuracy and freshness of its news and the independence with which it expressed opinions on social and political questions. Reporters and correspondents were engaged with great discrimination, and their best services were secured by prompt and liberal remuneration. The younger Mr. Walter acted himself as manager and editor. In 1805, the *Times* made an attack on lord Melville's administration at the admiralty, and the Walter family were in consequence deprived of the lucrative post of printers to the board of customs, which they had held for 18 years. At that time, there was, in consequence of the war, a great demand for continental news. The letters of the *Times'* correspondents abroad were transmitted through the regular channels, but the packets were stopped by the government, and Mr. Walter was informed that he would be supplied as a favor, like the other newspapers, with official information. He declined to avail himself of this offer, and it was then he took means to secure the special and early transmission of news for his paper. His success was remarkable; and on many occasions the public dispatches were anticipated. Thus, the *Times* announced the capitulation of Flushing two days, and the result of the battle of Waterloo some hours before the arrival of the regular dispatches. An increased circulation was the reward of these efforts, and the only limit to the increase of circulation was the impossibility of throwing off a sufficient number of copies of the paper by the hand-printing press. Mr. Walter saw the importance of introducing steam printing, and so early as 1804, he encouraged an ingenious compositor, named Martyn, to complete a machine he had invented; but Mr. Walter the elder, who was then alive, was less sanguine, and the scheme fell to the ground. Some years later, Frederick Koenig, a German, invented and patented a new press, which could be worked by the steam-engine, and Mr. Walter became his patron. He gave him, in 1814, an order for two machines, which, in anticipation of opposition on the part of the pressmen, were put up in premises adjoining the office. On Nov. 29, in the same year, it was announced

to these men that the paper had been printed by steam, and that there was no further occasion for their services. It is very creditable to the proprietors of the *Times* that no advantage was taken of the violent language used by the workmen on this occasion, and that their wages continued to be paid while they remained without employment. Under the old mode of going to press, about 250 copies could be printed per hour; but with the new machine it was possible to take 1100 impressions in the same time, so that the *Times* had a means of increasing its circulation not at the command of other newspapers. From this time Mr. Walter intrusted the superintendence of the literary department of the paper to Mr. Thomas Barnes, the first editor, born in 1785, who remained in the same situation until his death in May, 1841. Mr. Barnes wrote few articles, but he fixed on the subjects to be discussed, and displayed great ability in giving uniformity of tone and point to the articles passing through his hands. It was during his editorship that a series of leaders by Mr. Edward Sterling obtained for the paper new political and social influence, recognized by the name then applied to it, of "the thunderer." It was in his time, too (1834), that O'Connell attacked the accuracy of the *Times*' reports of the parliamentary debates, and was signally defeated by the testimony of those whose speeches were said to have been tampered with.

In 1841, Mr. John T. Delane succeeded Mr. Barnes as editor of the *Times*, and continued to conduct the paper with distinguished ability till his retirement in 1877. It was also in 1841 that newspaper won a new title to the confidence of the mercantile community, by the detection of a great scheme to defraud the leading banking-houses. If Mr. O'Reilly, the Paris correspondent, had not discovered the conspiracy, which was headed by a French baron, and other persons holding a good position in society, it was shown that the leading banking-houses would have been defrauded to the extent of a million sterling. The *Times* did not altogether escape punishment. It had to defend an action at law, in which, although a verdict for a farthing damages only was given, the defendants were obliged to pay their own costs. To relieve them of this burden, £2,700 were in a very short time subscribed by the bankers and merchants chiefly of the city of London. The offer of this sum was declined, and it was in consequence employed in another way, to commemorate the event which had led to its being collected. Two sums of £1,000 each were devoted to found *Times*' scholarships at Oxford and Cambridge in connection with Christ's hospital and the city of London school; and the balance was employed to erect marble tablets at the *Times*' office and the royal exchange, recording the obligations the mercantile community were under to the proprietors for the generous manner in which their interests had been protected. After the death of Mr. Barnes, Mr. Walter did not relax his efforts to obtain early intelligence. In 1842, a remarkable instance of the trouble and expense he incurred with this view, was brought under public notice. The news of the massacre in the Cabul Pass was first made known in the *Times*. The correspondent's letter containing it had been forwarded from Marseilles to Paris by carriages specially hired; from Paris to Boulogne by horse; thence to Dover by the steamer belonging to the newspaper (which had been for days in the channel with steam up); and from Dover to London again by horse. The letter reached the *Times* office at 2 o'clock on Sunday afternoon, and was immediately put in the hands of compositors who had been kept in attendance from the preceding day, in expectation of its arrival. The only news of the event which had reached England at the meeting of the house of commons next day was that contained in the *Times*, and it was at once assumed by the government as having all the authenticity of a dispatch received by the ordinary channels. The cost of conveying this letter from Marseilles to London was upward of £300. Noteworthy events in the recent history of the *Times* have been the publication of the letters by Dr. W. H. Russell and other special correspondents at the seat of successive European wars; the establishment of the *Times*' fund for the relief of the soldiers in the Crimea (£15,000 of which was collected in a fortnight); the formation of a fund, in 1858, for the relief of the homeless poor. Important mechanical improvements have recently been introduced in the printing-office: the "Walter" press in 1871, and the composing machine in 1872. A new office was built in 1873. The annual summaries from the *Times* for quarter of a century (1851-75) have recently appeared as a volume. In 1877 a weekly edition of the *Times* began to be issued. The prosperity of the paper continues unabated, and may be fairly attributed to the excellency and completeness of the parliamentary reports, the literary merit of the leading articles; the value of the special telegrams and letters, especially those from Paris and Berlin; the great fullness and accuracy of the parliamentary intelligence; the care and good taste displayed in the revision of contributions; the respect with which honest opinion is treated; and above all, perhaps to the absence of that sarcastic or abusive tone toward classes and sects, and that harsh literary criticism, by which other publications have obtained popularity. See Chambers's *Book of Days*, vol. i. p. 667; vol. ii. pp. 137, 566, 567, 632, 638; and an article in *Tinsley's Magazine* for February, 1872.

TIME-TABLES. See BRADSHAW'S RAILROAD GUIDE.

TIMO LEON, a great Greek general, and the liberator of Sicily from the dominion of "tyrants," belonged to one of the noblest families of Corinth, and was born there about 394 B.C. Timoleon's brother, Timophanes, having made himself tyrant of his native city. Timoleon either killed him with his own hand, or caused him to be killed. Opinion

was divided in Corinth as to the merit of this deed, one party extolling it as an act of the noblest patriotism, while the other demanded Timoleon's death as a murderer. The difficulty was got over by appointing him leader of a small band of mercenaries sent (344 B.C.) to Syracuse, the exiled citizens of which had begged assistance from Corinth, the mother-city, against the "tyrant" Dionysius and the Carthaginians. Outwitting the Carthaginians, Timoleon arrived safely at Tauromenium, where he was welcomed by the Syracusan exiles. Hicetas, "tyrant" of Leontini, was then striving to dispossess Dionysius, and secure the tyranny of Syracuse for himself, and had succeeded in getting possession of the whole city except the island citadel. Timoleon, with only a fifth of the number defeated him at Adranum; and marching to Syracuse made himself master of two quarters of the city. From this time onward Timoleon's career in Sicily was one of complete victory over all opponents. Dionysius the younger (q.v.), in 343 B.C. surrendered in despair the citadel of Syracuse, and was sent to Corinth. Hicetas having failed in the attempt to assassinate Timoleon, called in the assistance of a Carthaginian force of 50,000 men, which, however, was shortly after withdrawn by Mago, who had become suspicious of treachery. Hicetas at last fled to Leontini, leaving Timoleon sole master of Syracuse. After repeopleing the almost desolate city by recalling exiles, and inviting new colonists from Greece, Italy, and Sicily, he spent the next two years in enacting laws and organizing a constitution, which he put on a completely democratic footing. The Carthaginians, alarmed at the reviving power of Syracuse, and the prospect of union among the Sicilian Greeks, now sent an army of 80,000, under Hasdrubal and Hamilcar, to subdue the whole island. Timoleon, with only 12,000, encountered them (339 B.C.) on the Crimissus, and gained one of the greatest victories ever won by Greeks over barbarians. He now proceeded with his great project of expelling the tyrants of the other Greek cities, who, however, again called in the aid of the Carthaginians; but the successes of Timoleon soon made the Carthaginians glad to conclude a treaty, fixing the river Halycus as the boundary between their dominions and those of the Greeks. Hicetas, tyrant of Leontini, being now captured, was put to death with his wife and daughters; and shortly after Mamercus of Cutana suffered the same fate. Timoleon thus in about six years freed Sicily from nearly all its tyrants, and conferred upon the cities free constitutions, himself all the time taking no advantage of the immense influence which he thus obtained. After his great work was accomplished he lived among the Syracusans as a private citizen, receiving from them and from all the Greek world the greatest honor and respect: his advice was had recourse to by all the Sicilian cities in any emergency. He died in 337 or 335 B.C., having been blind for a considerable time previously, and was buried in the market-place of Syracuse, where a gymnasium, called the Timolonteum, was afterward erected over his tomb. Timoleon was undoubtedly one of the greatest generals and noblest characters produced by Greece; he appears to have been thoroughly unselfish, and to have set before him as his great aim the abolition of tyranny, and the establishment of freedom.

TIMON THE MISANTHROPE was a native of Athens, and lived in the time of the Peloponnesian war (431-404 B.C.). The little that is known concerning him is learned chiefly from Aristophanes and the other comic writers who attacked him. Disgusted with mankind, on account of the ingratitude of his early friends and companions, he lived a life of almost total seclusion from society, his only visitor being the "bold and insolent" Alcibiades. Numerous stories were current in antiquity regarding his eccentricities, one of which is, that he died because he would not allow a surgeon to visit him to set a limb. His grave, which was on the sea-shore, is said to have been planted with thorns, and to have been rendered inaccessible by the sea forming it into a small island.

We know him out of Shakespeare's art,
And those fine curses which he spoke—
The old Timon with his noble heart,
That strongly loathing, greatly broke.

—TENNYSON.

"The Timon of Plutarch and of the popular stories of Shakespeare's time was little different from the ordinary cynic. The Timon of Shakespeare is essentially high-minded and generous, his all-absorbing defect—the root of those generous vices which wear the garb of virtue—being the entire want of discrimination. If Timon had possessed one friend with whom he could have exchanged confidence upon equal terms, he would have been saved from his fall, and certainly from his misanthropy."—See *Introductory Remarks to Timon*, in Knight's Shakespeare.

This Timon must be distinguished from the Greek poet and philosopher of the same name, who lived about a century and a half later.

TIMOR, the most important of the chain of islands which stretch eastward from Java, lies in 8° 16' to 10° 25' s. lat. and 125° 25' to 127° 10' e. long., has an area of 8,820 sq.m., and pop. of about 400,000. A chain of wood-clad mountains runs throughout its entire length; Alas, on the s.e., being 11,800 ft. in height; Lakaan, in 9° 10' s. lat., 6,175 ft.; and Miomaffo, 4,630. The prevailing rocks are of the graywacke formation, which, at the s. base of Miomaffo, is cut by serpentine mountains of limestone; and calcareous rocks resembling ruins frequently occur. Magnetic iron, porphyry, syenite, gold, copper, malachite (containing 22 per cent of pure copper), sulphur, and naphtha are found.

The dry monsoon is from May to November, during which no rain falls. From November to April there are daily storms of rain and wind from the n.w.; the streams are swollen; the thermometer rises to 94° F. in the shade; the earth is covered with a dark-green carpet, and myriads of insects come into life. The rivers are numerous, but small, and most of them yield gold. Near the sea are very fertile lands, on which are grown rice, maize, beans, tobacco, sugar-cane, cotton, potatoes, and all sorts of tropical fruits. There are many varieties of the palm, the lontar being useful for food and other purposes. Timber trees suited for masts attain a height of 100 ft., and from 3 to 4 in diameter; the wild nutmeg, cinnamon, and tamarind are plentiful; and bamboos make the forests impenetrable in many parts. About 600 species of plants are known, a great number being medicinal, and few poisonous. Indigo grows everywhere, and potatoes in the mountains.

Three-fourths of Timor on the s.w. is subject to the Dutch, whose chief settlement is Koepang (Kupang); the remaining part in the n.e. belongs to the Portuguese, who have a town called Dilley, on the n. coast, with a safe roadstead, and a fort, which was nearly destroyed by an earthquake in 1857. Timor is divided into small kingdoms, ruled by rajahs under Dutch or Portuguese control.

Koepang lies at the base of a semicircle of wooded hills, on a beautiful bay in the south-west. It is irregularly built, the principal buildings being the governor's house and the Protestant church. There is a Mohammedan and a Chinese temple, one Dutch and two Malay schools. Pop. 3,500, including 100 Europeans and 500 Chinese. Whalers and trading-ships from Sydney, Van Dieman's Land, etc., call for provisions on their way to or from Java and Singapore; and Timor will be a convenient market for horses and supplies to the settlements in North Australia, which is only eight days' sailing distant.

The exports are—sandal-wood, horses, wax, tortoise-shell, edible nests, etc.; imports—cotton, woolen, and silk fabrics, provisions, and general supplies. Pearls are found on a bank 30 m. s.e. from Koepang. The natives are partly Oceanian negroes, and partly of Malay race. They worship a supreme being called "Lord of the sun." Near the Netherlands' settlements, some hundreds have been baptized, but missionary efforts have not been very successful. The fathers dispose of their daughters for gold and buffaloes, and polygamy prevails among the rich.

Koepang is the capital of the Netherlands' residency or government of Timor, which includes Samao, Rotti, Savu, the Sandal-wood island, Sumbawa, Flores, Adanara, Solor, Lomblem, Ombay, and all the small islands belonging to the chain.

TIMOR-LAUT, THE, OR TENIMBER ISLANDS, lie e. from Timor, in 6° 40'—8° 23' s. lat., and 130° 26'—132° 2' e. long., having an area of 3,150 sq.m. Pop. 15,000. By far the largest island of the group is Timor-Laut, which is 78 m. in length, and 21 in breadth. The soil is rich, and covered with the most luxuriant vegetation, various palms and other useful trees growing in great abundance. At a little distance from the shore, mountains encircle the island.

The next in importance is Larat, the n.w. point of which is in 7° 6' s. lat., and 131° 47' e. long. Area, 147 sq.m.; pop. 2,500. It is also mountainous. Further n. are Vorhate, Maru, and Molo. On the w. of Timor-Laut are Selu and Sejrah: a multitude of smaller islands of coral formation being scattered around.

On the larger islands, are small horned cattle, goats, swine, fowls, and a great variety of birds. Nothing can exceed the beauty of the blue-streaked lory (*eos reticulata*) and citron crested cockatoo (*cacatua citrino-oristatus*). Fish are plentiful in the rivers of the Timor-Laut and surrounding seas, and there is a considerable export trade in tortoise-shell and bêche-de-mer (q.v.). English trading-ships from Singapore, and south-sea whalers, sometimes visit these islands, and not unfrequently have been treacherously attacked. The natives are tall, well made, fairer-complexioned, and have more regular features than the Alfors. They are low in the scale of civilization.

TIMOTHY, a Christian disciple of Greek and Jewish parentage, well instructed in the Scriptures, and becoming, at Derbe, Paul's companion and helper in his missionary work. The apostle esteemed him "as a son with his father." In many of the epistles Timothy's name is joined in salutation with Paul's; he shared even imprisonment with the apostle, and was anxiously looked for by him when, having finished his course, he was ready to be offered. He is commonly spoken of in ecclesiastical history as the bishop of Ephesus; in the New Testament he appears as an apostolic vicar in the church in that city.

TIMOTHY, FIRST AND SECOND EPISTLES to, form, along with the epistle to Titus (q.v.), the three "pastoral epistles," the authorship of which is all but universally ascribed to St Paul. The external evidence for their genuineness is very strong, yet not complete. They occur in the Muratorian canon and the Peshito version as writings of St. Paul; Eusebius classes them among the *homologoumena*; while still earlier, Irenæus, Tertullian, and others of the fathers quote them as authoritative. On the other hand, Tatian (q.v.), one of the earliest of the fathers, denies their genuineness, as did also Marcion, Basilides, and most of the Gnostic teachers. Origen speaks of some who rejected 2d Timothy on account of the mention of "Jannes and Jambres," two apocryphal characters; while in modern times, Schleiermacher and Neander admit the Pauline origin of 2d Timothy, and

endeavor to disprove the genuineness of the 1st. Eichhorn, De Wette, Baur, and others go further, and seek to demonstrate the spuriousness of the whole three pastoral epistles. They consider the language and mode of thought quite distinct from the Pauline, and they (particularly Eichhorn) find no period in the apostle's life to which they could be properly fitted in. Their arguments have largely influenced the conclusions of very many scholars in this field. The purpose and scope of the epistles to Timothy are so well known, that an analysis, however slight, is almost superfluous. They consist of a series of warnings, exhortations, advices, and predictions.—See the "Introductions" of Alford, Wordsworth, Davidson, Wiesinger, Hug; and the list of commentators on the "Pastoral Epistles," appended to the article on the epistle to Titus.

TIMOTHY, EPISTLES to (*ante*). The design of the First is to instruct Timothy in the duties intrusted to him, and to guide the churches through him. Besides the introduction and conclusion it consists of three parts: The 1st sets forth Timothy's general duties, and gives him a special charge concerning false teachers who sought to bring Christian believers again under the yoke of the law. The 2d contains instructions concerning divine worship, the qualifications to be required in ministers and deacons, and the conduct to be exhibited by Timothy himself. The 3d condemns vices which were common at Ephesus. The design of the Second epistle is chiefly to utter a final warning against the errors and delusions which were making progress in the churches. It exhorts Timothy to maintain zealously sound doctrine, to be patient under trials, careful concerning his own conduct, and diligent in his endeavor to resist the efforts of false teachers. It closes with announcing the apostle's belief that his martyrdom was near and urging Timothy to come quickly to him.

TIMOTHY GRASS, the name commonly given to *phleum pratense*, a grass much valued for feeding cattle. It first received the name timothy grass in America, from the name of a person who did much to promote its cultivation there. Along with the other species of the genus, it often receives also the English name of CAT'S-TAIL GRASS. The genus *phleum* is distinguished by a panicle so compact as to resemble a close spike, single-flowered spikelets, with two nearly equal acuminate or almost awned glumes, two awnless palea, and the seed free. The species are mostly natives of Europe; a number of them are British, but the timothy grass alone is of any economical value. It varies very much in size according to soil and situation, succeeding best in moist rich soils. It is very extensively cultivated both in Britain and in America. It has strong culms, attaining a height of 4 to 5 ft., but is tender and nutritious, and much relished by cattle. It is perennial, but springs up rapidly, even in the year in which it is sown. Its spike-like panicle, from the form of which the name cat's tail has been given, is cylindrical, and often of several inches in length. The seed is very small.—*Phleum nodosum* is a very similar species, perhaps a more variety, with the lower part of the culm prostrate and swollen into knots or bulbs; the spike much smaller than in *P. pratense*. It is a very inferior grass, and is found only on dry soils.

TIMROD, HENRY, 1829–67; b. Charleston, S. C.; educated at the Georgia university. He practiced law and was a teacher for several years, during which he contributed verse to southern papers and magazines. He was editor of the *South Carolinian* (Columbia) from Jan., 1864, to the time of the burning of the city in the rebellion. Two editions of his collected poems have been published; the last, 1873, accompanied by a *Memoir* written by Paul H. Hayne.

TIMUQUANS, an extinct tribe of Indians, a part of the Choctaw family, which inhabited the coast of Florida, near St. Augustine. Missionaries were sent to them by the Franciscans as early as 1592, and continued their labors among them until Carolina and Georgia made war upon the tribe, almost annihilating them, the few who survived joining other tribes. A catechism, grammar, and church manual, in their language, was printed in Mexico about 1612, written by father Francisco Parejo. They were generally a peaceful tribe, and became somewhat civilized.

TIMUR, called also **TIMUR-BEG** and **TIMUR-LENG**, from his lameness, and vulgarly known among western writers as **TAMERLANE**, was the second of the great conquerors whom Central Asia sent forth in the middle ages, and was b. at Sebz, 40 m. from Samarkand, April 8, 1336. His biographers make him the fifth in descent from Karatchâr Nuyan, the relative and counselor of Genghis Khan (q.v.), and the ninth from Tûmna Khan, the direct ancestor in the male line of his renowned predecessor. The royal line of Jagatai (see **TURKISTAN**) had so utterly degenerated that the real power was in the hands of a number of independent chiefs of Mongol blood, each of whom, choosing a prominent city of the kingdom, there set up his standard and lorded it over the surrounding district. One of these chiefs, Hadji Berlas, the uncle of Timur, had established himself at Kesh, and here the future conqueror passed the first 24 years of his life in peaceful obscurity, devoting himself to the national amusements of hunting and equestrianism. But a formidable inroad (1360) of the Kalmucks of Jettah, who speedily subjugated Turkestan, expelling those chiefs who refused submission, effectually called forth Timur's hitherto untried energies. Declining to accompany his uncle in his flight, he boldly advanced with a small retinue to meet the invader, who was so charmed with his eloquence and address that he at once confirmed him in the government of Kesh, and

appointed him one of the principal ministers of his son, the new monarch of Turkistan. But neither chiefs nor people of the conquered country could long endure the tyranny of a race more cruel and barbarous than themselves, and the exiles and fugitives having been collected by the Ameir Husseyne, and joined by a powerful force under Timur, the Kalmucks were ultimately expelled in 1365, and Turkestan divided between its two liberators, who ruled together in the utmost harmony for some time; but war having arisen between them, Husseyne was defeated and slain, and Timur, by unanimous consent of the chiefs, was hailed as supreme lord of Turkestan. It was in the war with the Kalmucks that Timur received the wound in the thigh which rendered him lame for the rest of his life. He did not, however, either then or afterward, assume the rank of a sovereign, but elevating one of the royal race to the throne, reserved for himself the real authority and the title of *emir*. Having thus, in the space of ten years, risen, by dint of superior ability, to absolute authority over a numerous and warlike people, he proceeded to avenge his nation's wrongs on the Kalmucks of Jettah and Mogulistan; then turned westward to punish the predatory tribes of Khaurezm, who had plundered Bokhara; and spent the interval between these campaigns in supporting Toktemesh Khan, one of the claimants to the throne of Keptchak, ultimately (1376) placing him in undisputed possession. With the view of restoring its former limits to the empire of Jagatai, he summoned the prince of Herat and the other chiefs of Northern Khorassan to attend a "kouriltai," and on their refusal, immediately attacked and reduced them to submission, levying a moderate contribution as a penalty. But soon after (1383) the people of Herat again rebelled, murdered the envoys whom he sent to remonstrate; and 2,000 of the garrison, built up with an alternate layer of brick and mortar into the form of a pyramid, were left by Timur as a horribly singular and effective reminder of the consequences of rebellion. Seistan was next reduced, the Afghans of Suliman Koh chastised, and Timur returned, as was his wont, to spend the winter in the bosom of his family, at one or other of his numerous palaces near Samarkand. In the following year he commenced his career of aggression by the invasion of Mazanderan; and by the close of 1387 the whole of the districts west of the Tigris, from Tiflis to Shiraz, were subdued; those chiefs who voluntarily submitted being mostly confirmed in their governments, while the inhabitants of Ispahan—who, after a pretended submission, suddenly rose upon the Tartar garrison and massacred 3,000 of them—were almost completely exterminated. Meanwhile, Toktemesh Khan, of Keptchak, took advantage of his absence to invade Timur's territories on the Amu-Daria; on which Timur returned home, and, after driving the invaders out, pursued them to the head of the Tobol, then west across the Ural mountains and river, and though long baffled by the Arab tactics of his opponents, finally brought them to bay on the banks of the Bielaya (a tributary of the Kama), June 18, 1391, and almost wholly annihilated them. Resuming in 1392 his conquering march westward, he crossed the Tigris, subdued the numerous and warlike principalities to the east of the Euphrates, then advanced northward, through the gates of Derbend, to the Volga, and again routed Toktemesh (who had ventured to resume hostilities) on the banks of the Terek (1395), turned west as far as the Dnieper, and then north to Moscow, returning by Astrakhan and the Caucasus, leaving death and desolation in his track. In 1393 Timur campaigned in Hindustan, entering by the passes of the Hindu Koh, near Cabul, and routing *seriatim* the numerous armies collected to oppose him, till the number of prisoners became so great, that four days before the great battle before Delhi between Timur and the Indian emperor, the former, as a precautionary measure, ordered the murder, in cold blood, of all the males (said to be 100,000 in number), and then, after totally routing his opponents, took the capital. After a further advance to the Ganges, and more military successes, Timur retraced his steps to Samarkand, where the immense spoils of the expedition were expended in the adornment of the capital. Timur returned to Western Asia in the following year, and attacked the Egyptian empire in Syria, to avenge the murder of his ambassador, and the aid which the Mamaluke sultan had given to his enemies. Timur was as usual completely successful in the field; and the capture of Aleppo, Hama, Hems, Baalbek, and Damascus, equally proved his skill in the attack of fortified places. His mode of attack was to undermine the fortifications on all sides, then to fire the mines with wood steeped in naphtha, and on the destruction of the walls and battlements, which uniformly resulted, to charge in overwhelming force through the breaches. Similar conduct to that of the Mamluk sultan on the part of sultan Bajazet I., drew from Timur repeated remonstrances, which the other, in the overweening confidence springing from uninterrupted success, treated with contempt and answered with insult; but the advance of the Tartars to his frontiers soon opened his eyes to the greatness of his error, and with a powerful army he hastened to oppose them. The two hosts met at Angora (July 20, 1402), and after a long and obstinate contest, in which, although, the generalship of Bajazet and the steadiness of 20,000 Servian auxiliaries long balanced the superiority of Timur's troops, the Turks were totally routed, and Bajazet captured. The conquest of the whole of Asia Minor speedily followed; the Byzantine emperor did submission to the victor, as did also the Turkish ruler of Thrace; and the knights of St. John were expelled from Smyrna. The unfortunate Bajazet died after a few months' captivity, though uniformly treated with the greatest consideration; and about the same time Timur commenced his return—receiving on the way a most satisfactory embassy from the Egyptian sultan,

who was now glad to come to terms—conquering Georgia, where he passed the winter, and resuming his march in the following year by Merv and Balkh, reached Samarcand in 1404. Here he resumed preparations for the long projected invasion of China, continued the embellishment of the capital, and celebrated his great successes by the most gorgeous festivities. All things being now ready, he started with a large army for the Sihun, marched down that river to Otrar, where, being detained by the severity of the weather, he was attacked by an ague-fever, and died after a week's illness, Feb. 17, 1405. Timur holds a high position as a mere conqueror: his antagonists were mostly warlike and disciplined, and seldom much inferior in number; yet, from the savage horsemen of the Siberian steppes to the mail-clad warriors of Servia, all were alike forced to bow before the invincible prowess of the Mongol conqueror. The charge of cruelty brought against him is completely established by the massacre in India, but opposite to this might be placed numerous instances of a lenity and forgiveness almost incredible in a "barbarian." He did much to promote the arts and sciences throughout his dominions, but the speedy dissolution of his empire deprived his labors of any permanent utility. The principal authority for the life of Timur is Sherif-ed-Din-Ali's *History* (in Persian), translated into French by Pétis de la Croix, under the title of *Histoire de Timur-Bec, connu sur le nom du grand Tamerlan* (4 vols., Par. 1722). Several writings exist in Persian, attributed to Timur, but are of doubtful authenticity. Among these are the *Institutions* (with an English translation and a valuable index, Oxford, 1783); and the *Commentaries* of Timur, translated from a MS. of maj. Davy by maj. Stewart, late professor of oriental languages in the East India company's college. See also a translation of the narrative of Clavijo, envoy of Henry III. of Castile to Timur, by C. R. Markham (Hakluyt society, 1860).

TIN (symb. Sn, atomic weight 118,* spec. grav. 7.29) is a beautiful silvery-white metal, with a tinge of yellow, and a high metallic luster. It possesses a crystallized texture, and may be obtained in well-formed crystals of the pyramidal or tetragonal system; and it is in consequence of this crystalline texture that a bar of tin, when bent, emits a creaking sound, termed the *cry* of tin (the *Zinneschrei*, or tin-shriek of the Germans). Tin is a soft metal—being softer than gold—and is very malleable, and can be beaten out into very thin laminae, in which form it is known as tin-foil. At a temperature of about 212° Fahr. its ductility is considerable, but by no means remarkable, and it may be then easily drawn into wire, the tenacity of which is only moderate, as a wire with a diameter of 0.17 of an inch is broken by a weight of about 50 pounds. It is a tolerably good conductor both of heat and electricity, and when handled communicates a peculiar odor to the skin. It melts at a temperature of 442° Fahr.; and at a higher temperature, if air be present, it becomes converted into the binoxide, and burns with a brilliant white light. At ordinary temperatures it is very slightly acted on by exposure to the air, or to moisture. With regard to the action of the ordinary acids on this metal, prof. Miller observes that "nitric acid of specific gravity 1.3 acts upon it violently, and produces an insoluble hydrated binoxide, known as metastannic acid; at the same time, owing to the decomposition of water, a considerable quantity of ammonia is formed, which enters into combination with the excess of acid. Strong hydrochloric acid, when heated upon tin, dissolves it gradually, with extrication of hydrogen. Aqua regia, if not too concentrated, dissolves the metal, and converts it into bichloride. Dilute sulphuric acid is without action on the metal in the cold; but if the concentrated acid be boiled upon it, the tin becomes converted into sulphate, while sulphurous acid escapes. The hydrates of potash and soda act upon tin at high temperatures, hydrogen being evolved, while a soluble metastannate of the alkali is formed."—*Inorganic Chemistry*, 2d ed., p. 588.

There are two principal oxides of tin—viz., the protoxide (SnO) and the binoxide (SnO₂). There is also a sesquioxide, Sn₂O₃.

Protoxide of Tin, or stannous oxide (SnO), is obtained as a white hydrate (2SnO, H₂O) by precipitating a solution of the protochloride of tin with an excess of carbonate of soda. The protoxide acts as a base, forming salts which are colorless, redden litmus, and are for the most part soluble in water, from which crystalline tin is deposited on an inserted mass of zinc, constituting the so-called *tin tree*. None of these salts are of any special importance. *Binoxide of tin*, or stannic oxide (SnO₂), occurs native in the anhydrous form, crystallizing in square prisms, which are sufficiently hard to scratch glass, and generally of a brown color, from the presence of peroxide of iron or of manganese. In its artificially-prepared hydrated condition, it has the character of an acid, and according to its different modes of preparation, forms two remarkable varieties, known as stannic and metastannic acids. *Metastannic acid* is prepared by the action of strong nitric acid on tin, and occurs as a white, crystalline, insoluble mass, which, when dried in air, consists of H₁₀Sn₄O₁₅.5H₂O, but when dried at 212° Fahr., loses five molecules of water, and consists of H₁₀Sn₄O₁₀. By ignition, it becomes anhydrous, and of a pale straw color. In this form (in which it resembles the native binoxide in its properties), it is known in commerce as *putty powder*, and is employed for polishing plate, and for giving whiteness and opacity to enamels. In the hydrated state, it is insoluble in hydro-

* The atomic weights (and corresponding notation) adopted in this article are those of the unitary system (H=1, O=16, S=32, C=12) instead of the older dualistic system (O=8, S=16, C=6). See art. CHEMISTRY.

chloric or nitric acids, but is freely soluble in solution of potash or soda, forming salts which are not crystalline, but may be obtained in a granular form. Metastannic acid, in its hydrate state, may be recognized by the beautiful golden yellow metastannate of tin which is formed when it is moistened with protochloride of tin. *Stannic acid* ($\text{SnO}_2 \cdot 2\text{H}_2\text{O}$) is procured by the addition of carbonate of lime or of baryta to a solution of bichloride of tin, when it falls as a gelatinous precipitate. Unlike metastannic acid, it is readily soluble in nitric and hydrochloric acids; and at a temperature of 284° Fahr. it is converted into metastannic acid. In combination with the alkalies, it forms stannates, which crystallize readily, and whose formula is MO_2SnO_2 . The stannate of soda (Na_2SnO_2) is largely used as a mordant by the dyer.

There are two chlorides of tin—viz., a protochloride and a bichloride. The *protochloride of tin*, or stannous chloride (SnCl_2), may be obtained in a hydrated form by dissolving the metal in hydrochloric acid, and evaporating the solution, when the salt crystallizes in prismatic needles, having the composition $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$. The hydrated protochloride is extensively used as a mordant, and for deoxidizing indigo and the peroxides of iron and manganese, by the dyer and calico-printer; and in consequence of its deoxidizing or reducing powers, it is sometimes employed in analytical chemistry, especially in the determination of the quantity of mercury, since all the mercurial salts, when boiled with it, are decomposed, and yield their mercury in the metallic form. *Bichloride of tin*, or stannic chloride (SnCl_4), forms numerous double salts with the soluble chlorides; the compound of this nature which it forms with chloride of ammonium is represented by the formula $2\text{NH}_4\text{Cl} \cdot \text{SnCl}_4$, and is employed by the dyer under the technical term of *pink salt*. An impure bichloride, prepared by dissolving tin at a gentle heat in a mixture of nitric acid and sal-ammoniac, and known in the trade as *nitromuriate of tin*, or *composition*, is also largely used by dyers and calico-printers.

The sulphides of tin are three in number—viz., the protosulphide, the sesquisulphide, and the bisulphide. The *bisulphide of tin* (SnS_2) may be obtained in the hydrated state, in the form of a dingy yellow precipitate, by passing sulphureted hydrogen through a solution of a persalt of tin. In the dry way, it is procured in the form known as Mosaic gold, which is insoluble in any acid, though soluble in aqua regia; and is employed in the arts to give an appearance of bronze to the surface of metals.

Tin forms two sets of salts—the protosalts and the persalts, of which the protochloride and bichloride of tin may be taken as good examples. The *protosalts* (stannous salts) yield a very characteristic reaction with sulphureted hydrogen, a chocolate-colored precipitate of hydrated protosulphide of tin being thrown down; moreover, with a dilute solution of chloride of gold, they give either a beautiful purple precipitate, known as the *purple of Cassius*, or a brown precipitate of reduced gold, according to the quantity of the test that is used. The *persalts* (stannic salts) yield a dirty yellow precipitate of hydrated bisulphide of tin; while all the compounds of tin, when exposed on charcoal to the reducing flame of the blowpipe, give a white malleable globule of the metal.

Reduction and Manufacture.—Tin must have been one of the metals earliest known, as it enters into the composition of bronze (q.v.), of which the most ancient metallic weapons and tools were made. Tin and oysters were the products for which Great Britain was earliest famous. This general statement of facts is particularly noticeable. Tin is still largely obtained in Cornwall; and from that locality the Phœnician navigators took it to Tyre and Sidon. To this day England is by far the greatest tin-producing country, having raised in 1876 about 13,690 tons of dressed ore, or 8,500 tons of the metal. Bohemia and Saxony have some tin mines, and so also have Spain and Portugal. Tin has long been obtained from Malacca, in the Malayan peninsula, and from some of the neighboring islands. Australia, among her other mineral riches, produces tin, and the import from that country in 1876 amounted to 8,392 tons.

There is but one ore of tin of any importance—viz., the binoxide, or stannic oxide (SnO_2), which in its pure state consists of tin 78, and oxygen 22. It is called *tinstone* or *cassiterite*. Tin ore has nothing remarkable in its appearance; it is of various colors—as gray, various shades of yellow, and red, and black. Its specific gravity—a notable feature—is 6.9; and it strikes fire with steel. In Cornwall the tin ore occurs in mineral veins running through granite and slate rocks, or disseminated in crystals through their mass. The tinstone obtained from the veins or lodes is called *mine-tin*; and that procured by washing alluvial deposits is called *stream-tin*—the latter is the result of the disintegration of granite and other rocks which contained veins of tin. Washed cornish tin ore, usually called “black tin,” produces on an average about 67 per cent of metallic or “white” tin. Tin pyrites, or sulphide of tin, is found in some of the Cornish mines, but it is of little importance commercially. It may also be stated that ores containing copper are sometimes found with so large a proportion of tin that it is difficult to say whether they should be regarded as tin or copper ores.

The dressing of tin ore obtained from the mine is a difficult and delicate operation. It is so much dispersed through the gangue, that it requires to be stamped to a very fine powder by apparatus described under METALLURGY, before the metallic particles can be effectually separated. So small, comparatively, is the valuable portion of the ore, that at Huel Kitty mine, St. Agnes, not more than 84 lbs. of oxide of tin is obtained from a ton of the material brought to the surface; and in some mines the proportion of oxide to the rest of the material is not so much as 10 lbs. to the ton.

The stamped ore is copiously supplied with water passed through a grating adjoining the stamps, and conveyed into a channel where there are two pits. The purer and heavier portion falls into the first, and is called the *crop*; the remainder, called the *leanings*, passes through the first, and is retained in the second pit. Repeated washings are now necessary to separate as thoroughly as possible the impurities from the ore, and for this purpose a machine called a *buddle* is largely employed. Various kinds of apparatus are, however, used, but they are similar in principle to the jiggging sieve and sleeping table described under METALLURGY. We may notice here that a new form of buddle, known as "Borlase's buddle," has been recently introduced for dressing tin ores, by which a saving of about 30 per cent is said to be effected. Fig. 1 shows this machine. The ore and earthy matters, in the state of a thick mud, are conveyed by square pipes or channels to the circumference *a, a*, around which, by the aid of water, the metallic portion separates, while the lighter stony impurities flow toward the center, and are carried away. There are brushes at *b, b*, for agitating the ore during the operation. In the older form of buddle, this action is reversed, and the machine, instead of being depressed, is raised in the center.

The tin ore thus far purified has next to be deprived of its sulphur and arsenic; this is done in a reverberatory furnace (q.v.), the flues of which are connected with large condensing chambers, in which the arsenic is deposited in a crystalline form (see ARSENIC), and is afterward resublimed, to form the white arsenic of commerce. The sulphur which is present in the state of sulphide of iron is decomposed by the heat into sulphurous acid gas, and the remaining oxide of iron is removed by a subsequent

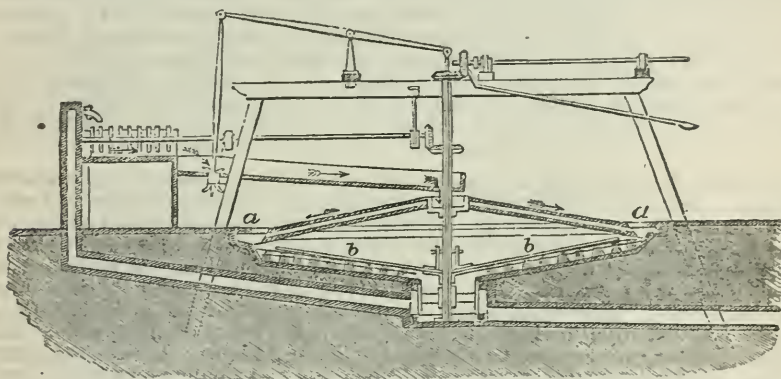


FIG. 1.

washing. Sulphide of copper, when present, is converted by roasting, and afterward exposing it to the air, into sulphate of copper, and is then easily dissolved out by lixiviation.

After this final washing the ore is ready for smelting in a reverberatory furnace. The charge consists of from 20 to 25 cwt. of ore mixed with one-sixth of its weight of powdered anthracite or charcoal, and a small quantity of lime or fluor-spar, to serve as a flux for the siliceous impurities. Before being put into the furnace, the mixture is moistened with water, to prevent the finely-powdered ore being carried away by the draught. When the charge is placed on the hearth of the furnace, the doors are closed, and the heat gradually raised for about six hours; the oxide is then reduced by the carbon of the coal. At this stage the furnace-door is opened, and the mass worked with a paddle, to separate the slag, which is raked off, and the richer portion of it melted over again. The reduced tin subsides to the bottom, and is run off into a cast-iron pan, from which it is ladled into molds, to produce blocks or ingots of a convenient size.

The tin has still to be purified, first by a process of *liqutation*, and afterward by that of *boiling*. "Liquation" consists in moderately heating the blocks in a reverberatory furnace till the tin, owing to its comparatively easy fusibility, melts and flows into the refining basin, leaving on the hearth of the furnace a residuary alloy of tin with iron and other metals. More blocks are added and heated in the same way, till the refining-basin contains about five tons. The tin is then ready for "boiling." In this operation billets of green wood are plunged into the melted metal, the disengagement of gas from which produces a constant ebullition, and so causes a scum (chiefly oxide of tin) to rise to the surface, which is then easily removed; at the same time, impure and dense parts fall to the bottom. When the agitation has gone on long enough, the bath is allowed to settle and cool. The tin then separates into zones—the upper consisting of the purest portion; the middle being slightly mixed with other metals; and the lower so much so that it requires to go through the refining process again. The residuary alloy of the liquation process has also its tin extracted and refined again.

In former times in Cornwall tin was smelted in a blast furnace (q.v.) instead of a reverberatory one; and this is still the case on the continent. By this method a pure tin is obtained, but the loss of metal in the process is greater. It suits best where coal is scarce and wood abundant.

Tin ores which contain the mineral wolfram (tungstate of iron and manganese) are treated by a special process, patented by Mr. R. Oxland, of Plymouth. This mineral and tin ore are so nearly the same in specific gravity, that no mechanical process of washing will separate them. Mr. Oxland's process consists in roasting the dressed tin ore with sulphate of soda, for the purpose of converting the insoluble tungstate of iron and manganese into the soluble tungstate of soda, which is easily removed by lixiviation. The oxides of iron and manganese, which are left in a finely-divided state, can then, from their lower density, be readily got rid of by washing. Since the invention of this process, some of the Cornish tin ores which used to sell at the lowest, now bring the highest price. The tungstate of soda procured in the operation has lately been found to be one of the most valuable substances for rendering cotton cloths noninflammable.

Tin when heated up to nearly its melting-point becomes brittle, and can then be broken into prismatic fragments called *dropped* or *grain tin*. The metal which is susceptible of this change may be considered to be of fine quality, as impure tin does not become brittle when so treated. The peculiar properties of tin, especially its malleability, its brilliancy, and the slowness with which it oxidizes at common temperature in the atmosphere, render it of great service in the arts. Utensils coated with silver require six cleanings for one that would suffice with "tinned" vessels. Tin is consequently very largely used to coat the surface of other metals, as iron and copper, especially thin sheet-iron, to form tin-plate (q.v.). Tin-plate goods are now manufactured on a gigantic scale in Birmingham, Wolverhampton, and Dudley. The increase has been brought about mainly by the introduction of stamping machinery, which does away with much of the labor formerly required to solder the pieces together.

With other metals tin forms some valuable alloys. See ALLOY. An amalgam of tin and mercury forms the metallic coating of mirrors. The applications of tin-foil, which is not more than $\frac{1}{1000}$ of an inch in thickness, are well known. From 60 to 80 tons of tin are annually used in Birmingham in the manufacture of coffin-lace.

TINAMIDÆ, a family of *gallinaceous* birds inhabiting the tropical portions of South America, having many remarkable features in their internal organization, and with the striking external character that the tail is exceedingly short or entirely absent. They are intermediate in form between the *phasianidæ* and the *bustards*, having the long neck and legs and small feet of the latter, and the naked scale covering the nostrils, as in the former. They are sometimes classed as a genus of the *tetraonidæ*, or grouse family. See GROUSE, *ante*. Many of the skull sutures are persistent, the brain is very small, and they have but little intelligence. Mr. Darwin saw many of the *tinamus rufescens* (called by English travelers partridges) while in South America. He says that a man on horseback by riding round them in a spiral, could kill an indefinite number by knocking them on the head with a stick. The more common method, however, was to catch them in a noose made of the stem of an ostrich's feather fastened to the end of a long stick. Of the family there are said to be as many as 41 species, and 9 genera, included in two sub-families, *tinaminiæ* and *tinamotinæ*, the first containing the genus *tinamus* with 7 species, and the genera *nothocercus*, 3 species; *crypturus*, 16 species; *rhynchotus*, 2 species; *nothoprocta*, 6 species; *nothura*, 4 species; *taoniscus*, 1 species. The second sub-family contains two genera, *eudromia*, 1 species, and *tinamotis*, 1 species. Some of the species inhabit the deepest forests, some live on the open plains. They occupy the same place in South America that the partridges do in North America. The females lay from half a dozen to a dozen eggs in nests, made on the ground.

TINCAL. See BORAX.

TINCTURE. See HERALDRY.

TINCTURES are defined by sir Robert Christison to be "solutions of vegetable and animal drugs, and sometimes of mineral substances, in spirituous liquids." The spirit most commonly employed is proof-spirit; sometimes rectified spirit is used; and occasionally ether. Ammonia is sometimes conjoined with the spirit, in which case the solution is termed ammoniated tincture. (It may be as well to remind the reader that *rectified spirit* is alcohol with 16 per cent of water, and that its specific gravity is .838; and that *proof spirit* is composed of 5 parts of rectified spirit mixed with 3 parts of water, the resulting compound containing about 47.5 per cent of water, and having a specific gravity of .920.) The choice between proof and rectified spirit depends on their respective solvent powers over the active principles of the drugs employed. The ether and ammonia are principally used for their antispasmodic properties. "The form of tincture," says sir Robert Christison, "is one of the best in pharmacy; for the menstruum is a powerful solvent of the active constituents of drugs; it presents them in small volume; it preserves them very long unaltered, and it is for the most part a convenient medium for uniting them with other substances in extempore prescriptions."

TINDAL, Dr. MATTHEW, a notable deistical writer, was the son of a clergyman at Beer-ferris, in Devonshire, where he was born about 1657. He was educated at Lincoln

and Exeter colleges, Oxford; took the degree of B.A. in 1676; and shortly after was elected fellow of All Souls' college. In 1685 he became a doctor of law; and, after a brief lapse into Romanism during the reign of James II., reverted to Protestantism, or rather, as events showed, into rationalism. His first work was entitled *An Essay concerning Obedience to the Supreme Powers, etc.* (Lond. 1693); followed in the course of a few months by *An Essay concerning the Laws of Nations and the Rights of Sovereigns*; but it was not till 1706 that he attracted any particular notice, when the publication of his treatise on *The Rights of the Christian Church asserted against the Romish and all other Priests who claim an independent power over it; with a Preface concerning the Government of the Church of England, as by Law established*, raised a storm of opposition, that may, perhaps, be considered to have fulfilled the prediction of the author, who told a friend that "he was writing a book which would make the clergy mad." A perfect torrent of replies and refutations poured from the press. Among those who signalized themselves as the adversaries of Tindal, the least obscure were Dr. G. Hickes and Conyers Place. Swift, it may be noticed in passing, also indulged in some "Remarks." On the continent, Tindal's work was quite differently received. Le Clerc, in his *Bibliothèque Choisie*, praises it very highly, as one of the solidest defenses of Protestantism ever written. In 1730, when he had nearly reached the age of 73, he published his most celebrated treatise, entitled *Christianity as old as the Creation, or the Gospel a Republication of the Religion of Nature*, which effectually settled the question of his religious creed. The design of the work is to strip religion "of the additions which policy, mistake, and the circumstances of the time have made to it,"—in other words, to eliminate the *miraculous* element, and to prove that its morality, which is admitted to be worthy of an "infinitely wise and good God," is its true and only claim to the reverence of mankind. Tindal's purpose was rather constructive than destructive; and it was on this account that he called himself a "Christian Deist." He was answered, among others, by Dr. Waterland, Mr. Foster (an eminent dissenting minister), Dr. Conybeare (afterward bishop of Bristol), and Dr. Leland (q.v.), with various degrees of ability and success. Tindal's book is written in excellent English, and is unquestionably a very able performance, giving its author a distinguished place among the 18th c. deists. Tindal died Aug. 16, 1733.

TINDER, an inflammable material, usually made of half-burned linen. It was formerly one of the chief means of procuring fire before the introduction of chemical matches. The tinder was made to catch the sparks caused by striking a piece of steel with a flint; and the ignited tinder enabled the operator to light a match dipped in sulphur. This intermediate step was necessary in consequence of the impossibility of making the tinder flame. Partially decayed wood, especially that of willows and other similar trees, also affords tinder; and certain fungi furnish the German tinder, or *Amadou* (q.v.).

TINEA is a term somewhat vaguely employed to designate certain parasitic diseases of the skin, and especially of the scalp. Three of the most important varieties of tinea, viz., *tinea circinata* (ringworm of the body), *tinea tonsurans* (ringworm of the scalp), and *Tinea sycosis* (ringworm of the beard), have been already described in the article Ringworm (q.v.). In these three varieties, which are included in the general term *tinea toudens*, the vegetable parasite known as *trichophyton tonsurans*, figured in the above article, is always present. It now remains to notice the *tinea decalvans* of Bateman, known also as *porrigo decalvans*, *alopecia circumscripta*, etc. It is defined by Aitken as "a fungus disease, causing the formation of rounded or oval patches of baldness, sometimes solitary, more generally multiple. It affects the hairy scalp principally; but the beard and hairy portion of the skin may also suffer."—*The Science and Practice of Medicine*, 2d ed. vol. i. p. 925. The fungus which causes these patches of baldness was detected by Gruby in 1843, and named the *microsporon audouini*. It differs from the *ichophyton* by its numerous waved filaments, and the extremely small size of its sporules, and likewise by its position, not being found in the interior of the root of the hair, but forming a little tube round each hair, and thus causing it to soften and break down. The hairs thus affected become dull and partially loose; the skin in which they are implanted becomes red, swollen, and slightly itchy; and a whitish matter (the sporules of the fungus) may soon be observed on the diseased skin and hairs. The hairs then suddenly fall off from the affected part, leaving a round bald patch of a very white color. The disease is capable of transmission from one person to another, although less readily than *tinea tonsurans*. It chiefly affects children. The treatment consists in preventing the spread of the disease by extracting the hairs round the circumference of the patch, and washing the head daily with soft soap; and all the young hairs within the patch must be extracted till a healthy crop begins to appear. Moreover, a solution of sulphurous acid, as recommended for ringworm, should be applied. When by these means the fungus has been destroyed, stimulants must be applied to the bald patches. A mixture of equal parts of *collodium* and of *ether anthracidialis* (*collodium vesicans*) is, according to Dr. Aitken, the most useful stimulant in these cases.

TINEIDÆ, a family of small moths, the smallest insects of the lepidopterous order. The body is long and slender, the wings entire, often narrow, mostly convoluted in repose. Many of them are very brilliantly colored, exhibiting beautiful little stripes and

patches of gold and silver. Many deposit their eggs in animal substances, on which the larvæ feed, making cases for themselves out of the substance they feed on. The clothes moths (q.v.) are a familiar example.

TINGI, *Magonia glabrata*, a tree of the natural order *sapindaceæ*, which covers large tracts of country in some parts of Brazil, to the exclusion of almost everything else, generally growing to the height of 30 or 40 ft., but sometimes much higher. An infusion of the bark of the roots is used to poison fish. The fruit is a large dry triangular capsule, filled with broad flat seeds, from which a kind of soap is made. The membrane which covers the cotyledons is stripped off, and they are steeped in water till they begin to swell and soften, and boiled with a little tallow. A homogeneous mass is formed, which is used for washing clothes.

TINKAR'S ROOT, *Triosteum perfoliatum*, a shrubby plant of the natural order *caprifoliaceæ*, a native of North America, the root of which is used as an emetic and mild cathartic. It derives its name from Dr. Tinkar, who first brought it into notice.

TINNÉ, a name given to the tribes of Indians of the Athabascan family, inhabiting the portion of land lying between Hudson's bay and central Alaska. They number about twenty tribes, the most prominent of which are the Chippewyans or Montagnais, the Dog Ribs, Beavers, Tacullies or Carriers, Yellow Knives, Kenai, Brushwood, and Rocky Mountain Indians. They are peaceful, and subsist on game and fish; their weapons are of stone or bone, of simple construction. The Chippewyans do not bury their dead; the Tacullies burn them. They are tall, have dark complexions and full faces, with considerable beard.

TIN'NE, ALEXANDRINA PETRONELLA FRANCINA, 1835-69; b. Holland; daughter of an English merchant and the baroness Van Steengracht-Capellen. After extended travels in Europe and the east she left Khartoon in 1862 on a visit to the White Nile. She went on a steamboat, accompanied by transport ships, and many attendants. During this expedition she explored the w. branch of the White Nile. Many of her party died of exposure. In 1869 she left Tripoli for Borneo, with a party of fifty, only two of whom were Europeans. On her way to Ghat she was murdered by her retinue at Fezzan.

TINNEVELLY, *Tiru-nel-vēli*, chief t. of the British district of the same name, is situated near the river Chindinthoora, 350 m. s.w. of Madras. The town of Tinnevely is connected with the town and military station of Pallamcottah, on the opposite bank of the river. Pop. about 20,000.

TINNITUS AURIUM is the Latin translation of, and ordinary medical term for, ringing in the ears. In most cases it is an unimportant symptom, depending on some local temporary affection of the ear, or on some disturbance of the digestive system with which the part of the brain, from which the auditory nerve springs, sympathizes, or which excites the cerebral circulation (as often occurs in the morning after too liberal evening potations); but as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. Hence, although commonly of no consequence, it is a symptom that, especially if permanent, must be carefully watched. It may be readily induced for a few hours by a large dose of quinia.

TINOCERAS, an extinct genus of herbivorous mammals from the eocene formation of Wyoming and Utah, the first known members of the new order *dinoceraæ*, so named from the best known genus *dinoceras*, which may be regarded as the typical one, and characterized as follows: Skull long and narrow; facial portion much extended. The upper surface of the skull has three pairs of bony processes, which are regarded as having been the support of horns (whence the name "terrible-horned"). The smallest pair are near the end of the nasal bones; a larger pair spring from the cheek bones in front of the orbits; the largest pair are on the cranial parietal bones, and are situated upon a large crest or ridge which extend from near the orbits around the lateral and posterior margins of the cranium. Dental formula, $i \frac{0-0}{3-3}; c \frac{1-1}{1-1}; pm \frac{3-3}{3-3}; m \frac{3-3}{3-3}$. As in rumi-

nants the premaxillaries are without teeth, and probably also supported a callous pad. The upper canine teeth, strongly set in the maxillary bones, are decurved, trenchant, and separated by a diastema from the molar teeth. The cervical vertebrae are longer than in the elephant, while the legs are short, and the skull elongated, allowing the mouth to easily reach the ground. A proboscis was therefore not needed, and probably did not exist. Feet short and stout; five toes before and behind. The brain cavity is the remarkable feature, and indicates a brain smaller in proportion than that of any other mammal, smaller even than that of some reptiles, the cerebral hemispheres being extremely small, not overlapping either the cerebellum or the olfactory lobes. Some of these animals were nearly as large as the elephant.

TINOS, or TINO (anc. *Tenos*), an island in the Grecian archipelago, belonging to the group of the Cyclades, lies immediately s.e. of the island of Andros, 53 m. off the coast of Bœotia. It is 18 m. long, 8 m. in extreme breadth, has an area of 70 sq.m., and a pop. of about 21,000. The Tinos were conspicuous among the ancient Greeks for

their industry, and they still maintain their pre-eminence in that respect. The island is carefully cultivated, well-watered, has a delightful climate, and is very productive in silk, wine, barley, and fruits. Silk gloves and stockings are manufactured; and the inhabitants have made themselves famous as workers in marble, which is found in the island. In the modern town of Tenos, or St. Nicholas, is a cathedral built of white marble, and famous as a resort for pilgrims.

TIN-PLATE. The manufacture of this article forms a branch of the iron trade. The art of tinning plate-iron is said to have been invented in Bohemia, about the beginning of the 16th c., although the tinning of copper was known some time earlier. Tin-plate was first made in England about the year 1670.

Sheet-iron for tin-plates is made either of charcoal-bar or coke-bar, which has been rolled with particular care, in order to avoid scales on the surface. Before tinning, the plates are called "black plates." When the iron has been cut to the required size, the plates are "pickled"—that is, they are immersed in hot sulphuric or hydrochloric acid which has been diluted by 16 parts of water to 1 of acid, the use of the acid being to remove all oxide. After this, the plates require to be washed several times in water; and then follows an annealing in closed cast-iron boxes in a reverberatory furnace. The next operation consists in passing the plates two or three times through chilled iron rollers highly polished with emery and oil, so as to give them a well-polished surface. Once more they are sent to the annealing furnace, passed again through dilute sulphuric acid, which is followed by another washing, but this time in running water, and then scoured with sand. This should leave them quite clean and bright for the tinman.

Each plate is now put singly into a pot of melted grease (which has become sticky by use), and left till it is completely coated, after which the plates are taken in parcels and plunged into a bath of melted tin covered with grease, called the "tin-pot." They pass from this to another vessel with two compartments called the "wash-pot," both of which contain melted tin of the purest quality, and like the last, covered with grease. The plates are put into the first compartment in parcels, where they receive a coating of purer tin than that of the "tin-pot," and are then withdrawn one by one, and wiped on both sides with a hemp brush; the marks of which are obliterated by another dipping in the second compartment of the "wash-pot." This last dipping also gives the plates a polish. The next thing is the removal of the superfluous tin by immersing the plates in a pot containing tallow and palm oil, maintained at a temperature no higher than will keep the tin in contact with the oil liquid, and so allow it to run off. The final treatment consists in working the plates separately in troughs of bran with a little meal, and then rubbing them with flannel.

There is a variety of tin-plates called "terne-plates," coated with an alloy of tin and lead, in which the proportions vary from one of lead and two of tin to two of lead and one of tin. They are largely exported to Canada, where they are used for roofing.

The manufacture of tin-plates has extended very rapidly of late years, and it is estimated on good authority that no less a quantity than 140,000 tons are now annually made in Great Britain.

The exports which in 1864 amounted to 1,003,569 cwts., of the declared value of £1,264,100, had in 1877 increased to 3,064,520 cwts., valued at £3,033,126.

TINSEL OF THE FEU, in the law of Scotland, means an irritancy or forfeiture of a feu-right caused by the failure to pay the feu-duty for two whole years. A statute of 1597 authorized, in such a case, the superior to take steps to obtain a decree of declarator that the feu was forfeited; but the vassal might, any time before decree, purge the irritancy by paying the arrear.—**TINSEL OF THE SUPERIORITY** is a similar remedy which a vassal has against the superior who has not got himself infeft, so as to be in a position to complete the vassal's title. In such a case, the tenant may under the statute 1474 charge the superior, that if he do not within 40 days obtain infeftment, he shall lose the tenant or vassal for his (the superior's) lifetime, and thereby all the casualties that may fall to the superior from the act or delinquency of such vassal.

TINTERN ABBEY, a famous ecclesiastical ruin on the right bank of the Wye, in Monmouthshire, about 9 m. s.e. of Monmouth. The abbey—properly so called—was founded in 1131 for Cistercian monks, by Walter de Clare, and dedicated to St. Mary; but already in the previous century a church had been built, and in 1268 mass was celebrated by abbot and monks for the first time. The style of architecture is a transition from early English to decorated, and is very fine. Most of the building, except the roof and tower, remains. Tintern abbey owes not a little of its celebrity to Wordsworth's poem, entitled *Lines Composed a few Miles above Tintern Abbey, on Revisiting the Banks of the Wye*—though in reality the poem has nothing whatever to do with the abbey, which is not once mentioned or alluded to in it.

TINTORETTO, a Venetian historical painter, so called from the fact of his father being a dyer (*tintore*), but whose real name was **JACOPO ROBUSTI**, was b. in 1512. He studied for a short time under Titian, but appears to have been for the most part self-taught. His motto was a very fine one: *Il disegno di Michael Angelo, e 'l colorito di Tiziano* (The design of Michael Angelo, and the coloring of Titian); but it cannot be said that he adhered to it, and he is certainly a long way inferior to either artist. Still, his assiduity, when young in acquiring a varied knowledge of the human figure under

all possible aspects of light and shade, commands respect, in spite of the theatrical means to which he often resorted; and the rapidity of his pencil (which got him the name of *Il Furioso*) is at least astonishing. Sebastian del Piombo remarked that Tintoretto could paint as much in two days as he could do in two years. A catalogue of Tintoretto's works, specimens of which are to be found in almost all galleries, is impossible within our limits. We can only mention a few of the more famous, as "Belshazzar's Feast, and the Writing upon the Wall" (fresco for the arsenal at Venice), "The Tiburtine Sybil," "The Last Supper and the Washing of the Disciples' Feet," "A Crucifixion," "The Worship of the Golden Calf," "The Last Judgment" (the last two immense pictures, 50 ft. high, and very splendid in conception), "St. Agnes Restoring to Life the Son of a Prefect," "The Miracle of St. Mark," a "Resurrection of Christ," "The Slaughter of the Innocents," and a grand picture of "Paradise"—34 ft. high by 74 long, with upward of 100 figures. Some of Tintoretto's earlier pictures are very carefully finished, but his later ones are dashed off with a fatal haste, that justifies the remark of Annibal Caracci, that if he "was sometimes equal to Titian, he was often inferior to Tintoretto." Tintoretto lavishly indulged in *chiar' oscuro*, but his coloring is not gay or brilliant; it is rather cold and leaden, as might be expected of a painter who, when asked what were the prettiest colors, replied: "Black and white."

TIOGA, a co. in s. New York, adjoining Pennsylvania, drained by the n. branch of the Susquehanna river, and by Owego and Cayuta creeks; traversed by the Southern Central, the Utica, Ithaca and Elmira, and the New York Lake Erie and Western railroads, about 475 sq.m.; pop. 32,672—31,035 of American birth. The surface is hilly. The soil is fertile. The principal productions are oats, wheat, corn, buckwheat, wool, and butter. Manufacturing is extensively pursued. Co. seat, Owego.

TIOGA, a co. in n. Pennsylvania, adjoining New York; drained by the Tioga river, and by Pine and Lycoming creeks; crossed by the Corning, Cowanesque and Antrim, and the Tioga railroads; about 1050 sq.m.; pop. '80, 45,814—40,267 of American birth. The surface is hilly and well wooded. Iron and coal abound. The soil is suitable for grazing. The principal productions are oats, corn, wheat, buckwheat, maple sugar, and butter. There are extensive manufactures. Co. seat, Wellsborough.

TIPPAAH, a co. in n. Mississippi, adjoining Tennessee; drained by Tippah creek, and the Tallahatchie and Hatchie rivers, traversed by the Ship Island, Ripley and Mississippi railroad; about 480 sq.m.; pop. '80, 12,866—3,065 colored. The surface is rolling. The soil is fertile. The principal productions are corn, cotton, wheat, wool, butter, and cattle. Co. seat, Ripley.

TIPPECANOE', a river of Indiana, United States, which rises in a lake of the same name in the northern part of the state, flows s.w. 200 m., and empties in the Wabash, 9 m. above Lafayette. It is famous for the battle fought on its banks, Nov. 5, 1811, in which the Indians, under Tecumseh's brother, the prophet, were defeated by gen. Harrison.

TIPPECANOE', a co. in w. Indiana, drained by the Wabash river, the Tippecanoe river, and several creeks; traversed by the Wabash and Erie canal, and by the Louisville, New Albany and Chicago, the Indianapolis, Cincinnati and Lafayette, and the Wabash, St. Louis and Pacific railroads; about 500 sq.m.; pop. '80, 35,966—31,475 of American birth. The surface is level. The soil is productive. The principal productions are corn, wheat, oats, butter, and wool. There are extensive manufactures. Co. seat, Lafayette.

TIPPECANOE, BATTLE OF, fought Nov. 5, 1811, in Indiana, on the banks of Tippecanoe river, on the site of the present village of Battle Ground, between the Americans under gen. Harrison, and the Indians under the prophet, Tecumseh's brother.

TIPPERARY, an inland county of the province of Munster, Ireland, bounded on the s. by Waterford; and on the w. by Cork, Limerick, Clare, and Galway. Area, 1659 sq.m., or 1,061,731 acres, of which 843,837 are arable, 178,183 uncultivated, 2,359 in towns, and the rest under plantations and water. Pop., '91, 216,713, of whom 203,227 were Catholics, 13,459 Protestants: this includes Presbyterians and other sects of Christians; there were no Jews in Tipperary that year. In the year 1878, the number of acres under crops of different kinds was 266,964. In the same year the cattle numbered 236,403; sheep, 269,638; and pigs, 89,850. The inhabitants are mostly engaged in agriculture. The annual value of property in the county is £680,000. The number of children attending the national schools in the county of Tipperary in 1875 was 38,743, of whom 37,779 were Roman Catholics, and 853 of the Episcopal church.

The county of Tipperary, for the most part lies in the basin of the river Suir. This river rises near Templemore, in the n. of the county; and after traversing Tipperary for a distance of about 76 m., forms for a time its boundary with Waterford; through which county it ultimately passes to the sea. The other rivers of Tipperary are the Nore, the Nenagh, and the Brosna. The lakes are numerous, but of small size. The county is intersected by the Great Southern and Western, and the Limerick and Waterford railways. The surface is generally plain, and the mountains which diversify it are rather groups than portions of any connected range. These mountains are the Galtees, rising to 3,000 ft., Knockmeledown (2,700 ft. high), and Slievenam on the s.; Keeper mountain, 2,100

ft. high, and its group on the w.; and the Slievardagh Hills on the east. There is one very curious isolated height called the Devil's Bit, to which many popular legends attach. The soil of the plain is a rich calcareous loam, singularly fertile and productive, especially a district called the Golden Vein, in the center of which stands the town of Tipperary (q.v.), and which extends from Limerick to the county of Kilkenny. There is another similarly fertile district in the n. of the county. In geological formation the plain belongs to the great central limestone district. The mountains are for the most part of clay-slate, surrounded or surmounted by sandstone; the Galtees, together with a contiguous group called Slievenamuck, as well as the intervening valley, being sandstone. There is a large amount of bog in the central and eastern districts, one continuous tract extending a distance of 30 miles. The mineral productions are coal (anthracite), copper, and lead, also zinc and very good fire-clay; and slates of an excellent quality are quarried near Killaloe. Wheat was formerly grown in large quantities; but of late years dairy-farming and the raising of cattle have been rapidly taking the place of the production of cereals. Flax is but sparingly produced.

The county, which sends two members to the house of commons, is divided into two ridings, n. and s., each of which is subdivided into six baronies.

Anciently, Tipperary formed a part of the two distinct principalities of Ormond, or n. Munster, and Desmond, or s. Munster: after the English invasion, Tipperary was formed into a county by king John in 1210; but the authority of the conquerors was long little more than nominal. Eventually, it came to be divided between the Anglo-Norman families of Butler, which held Ormond, and Geraldine, to whom a portion of Desmond fell. The antiquities are numerous, as well Celtic as Anglo-Norman. In the latter, the city of Cashel is specially rich; and the ruin of Holy Cross is a noble specimen of the monastic remains of the mediæval period, as the castle of Cahir is of the military and baronial architecture of the same age. There is a series of caves near the border of the co. of Cork, in the vicinity of Mitchellstown, which attract much notice as a natural curiosity. They consist of a number of chambers and galleries formed by stalactite deposits, one portion of the range being no less than 870 ft. in length.

TIPPERARY, a market t. of the county of the same name, on the river Arra, 111 m. s.w. from Dublin by the mail-coach road, and 110 by the Great Southern and Western railway, with which it is connected by the Limerick and Waterford railway. Tipperary occupies a central position in a fine county, and carries on, therefore, an extensive trade in butter. Pop. '71, 5,638; town rates levied, £120. The town is of very ancient foundation, and soon after the invasion was occupied as a strong place by the English, who built a castle in it during the Irish expedition of king John. This castle, however, fell soon afterward into the hands of the Irish under the prince of Thomond. The town is well built, but of no architectural pretensions, and contains a large and handsome Roman Catholic church, a Protestant church, Presbyterian and Methodist meeting-houses, two national schools, and one school of the Erasmus Smith endowment.

TIPPOO SAHIB, Sultan of Mysore, and son of Hyder Ali (q.v.), was b. in 1749. Efforts were made to carefully instruct him in the various branches of learning cultivated by Mohammedans; but Tipptoo much preferred the practice of athletic exercises, and the companionship of the French officers in his father's service, from whom he acquired a considerable acquaintance with European military tactics. This knowledge he put to effective use during his father's various wars, by completely routing col. Bailey at Perimbakum (Sept. 10, 1780), and (Feb. 18, 1782) col. Braithwaite on the banks of the Kolerun in Tanjore, though these were his only important engagements with the British forces in which he could boast of success. On the death of his father, he was crowned with little ceremony, returning at once to the head of his army, which was then engaged with the British near Arcot. On April 28, 1783, he captured and put to death most of the garrison of Bednore; but news of the peace between France and England having reached his French allies, they retired from active service, and Tippoo ultimately agreed to a treaty (Mar. 11, 1784), stipulating for the *status quo* before the war. During the continuance of this peace, he occupied himself in regulating the internal administration of Mysore, sent ambassadors in 1787 to France to stir up a war with Britain, and failing in this, at length so far allowed his inveterate hatred of the English to overcome his judgment, as to invade (April, 1790) the protected state of Travancore. In the ensuing war (1790-92), the British, under col. Stuart and lord Cornwallis, were aided by the Mahrattas and the Nizam, who detested their powerful and aggressive neighbor equally from fear and religious hatred (Tippoo being a fanatical Mohammedan); and though the tactics of the sultan in laying waste the Carnatic almost to the very gates of Madras baffled his opponents for a time, he was ultimately compelled (Mar. 16, 1792) to resign one-half of his dominions, pay an indemnity of 3,030 lacs of rupees, restore all prisoners, and give his two sons as hostages for his fidelity. Nevertheless, his secret intrigues in India against the British were almost immediately resumed; another embassy was sent to the French; and the invasion of Egypt by the latter in 1798, and Tippoo's machinations, having become known to the governor-general almost contemporaneously, it was resolved to punish the perfidious sultan. Hostilities commenced in Mar., 1799; and two months after, Tippoo was driven from the open field, attacked in his capital of Seringapatam, and after a gallant resistance, slain. He was buried in his father's mausoleum, May 5,

1799, during a storm of thunder and lightning, which caused the death of several Europeans and natives. His government of Mysore after 1792 was of a most oppressive character, yet Tippoo was extremely popular, and after his death was esteemed by the Mohammedans as a martyr to the faith of Islam. Of the chief articles of *virtù* with which his palace abounded, many are now in Fife house, Whitehall (having been removed thither from the East India house in Leadenhall street), as also the half of his library, the other half being preserved at fort William, Bombay.

TIP'TOFT, JOHN, Earl of, 1425-70; b. England; educated at Balliol college, Oxford. He was noted for his scholarship and for his patronage of William Caxton, who printed his translation of Cæsar's *Commentaries* and the *De Amicitia* of Cicero. By Henry VI. he was made earl of Worcester and lord-deputy of Ireland, ruling with great severity. In the "war of the Roses" he sided with Edward IV., by whom he was made lord high treasurer and knight of the garter. His cruelty in Ireland and toward his Lancastrian prisoners contrasts strangely with his love of literature and education. He visited Rome and Jerusalem, and brought many valuable manuscripts now in the Oxford libraries. After the Lancastrians came into power he was beheaded for alleged maladministration in Ireland.

TIPTON, a co. in central Indiana, drained by Cicero creek and the Wild Cat river; traversed by the Lafayette, Muncie and Bloomington, the Indianapolis, Peru and Chicago, and the Pittsburgh, Cincinnati and St. Louis railroads; 275 sq.m.; pop. '80, 14,402—14,107 of American birth. The surface is level. The soil is fertile. The principal productions are corn, wheat, wool, and butter. Co. seat, Tipton.

TIPTON, a co. in w. Tennessee, on the Mississippi river, drained by the Hatchie river, and other streams; traversed by the Louisville and Nashville railroad; about 375 sq.m.; pop. '80, 21,033—15,499 colored. The surface is level. The soil is fertile. The principal productions are corn, wheat, oats, and cattle. Co. seat, Covington.

TIPULA AND **TIPULIDÆ**. See CRANE-FLY.

TIRABOSCHI, GIROLAMO, an eminent Italian author, was b. at Bergamo, Dec. 28, 1731, studied at Monza, and afterward entered the order of the Jesuits. Toward 1766 he was appointed professor of rhetoric at Milan, where he wrote his first work, *Vetera Humiliatorum Monumenta* (1766); and in 1770 succeeded father Granelli in the post of librarian to the duke of Modena. Tiraboschi now availed himself of the rich stores of the ducal library, besides making extensive researches in other archives, to compose his *Storia della Letteratura Italiana* (History of Italian Literature), which began to appear in 1772, and was finished in 1783 in 13 vols. It embraces the history both of ancient and modern Italy, and is especially valuable for the light which it throws upon the intellectual condition of the Peninsula during the dark ages, and the brilliant period from Dante to Tasso. Tiraboschi ends his elaborate survey with the close of the 17th century. It is impossible to praise too highly the learning and the conscientious accuracy of the author, even although the circumstance that many of the epochs have since been made the subject of minute and special inquiries, necessitates a revision of parts of the work. A second edition was edited by Tiraboschi (1787-94), and abridged translations have appeared in French and German. The best edition is that published at Milan (16 vols., 1822-26). A continuation embracing the literature of the 18th c. was written by Lombardi (*Storia della Letteratura Italiana nel Secolo XVIII.*). Tiraboschi died at Modena, June 3, 1794. Other works by this author are *Biblioteca Modenese* (6 vols., Mod. 1781-86); and *Memorie Storiche Modenesi* (3 vols., Mod. 1793).

TIREE, one of the inner Hebrides, included in Argyshire, lies 20 m. n.w. of Iona. It is 13 m. long, and over 6 m. in extreme breadth. The surface is low, rising in the n. to little more than 20 ft., and in the s. to about 400 ft. above sea-level. The absence of trees and shrubs gives to the island a bleak appearance. There are numerous small lakes. Upward of 500 acres are under tillage, while 10,700 acres are in pasture or waste-land. Some interest attaches to the island from the number of Scandinavian forts which dot the shores, and from the standing-stones, ruined churches, and ancient graves which occur in the interior. Pop. '71, 2,834, who support themselves by rearing cattle, fishing, and exporting poultry and eggs.

TIRE'SIAS, in Greek mythology, figures as a famous prophet, who, according to one legend, was struck blind by the goddess Athena, because he had seen her bathing. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favor of the latter; when Zeus as a compensation granted him the inner vision of prophecy, and prolonged his life for several generations. He is consequently prominent in many of the mythical stories of Greece, but at last found death by drinking from the well of Tiphlossa. Even in Hades, Tiresias retained his prophetic power.

TIRLEMONT (Flemish, *Thienen*), a town of Belgium, in s. Brabant, on the Great Geete, 38 m. e.s.e. of Brussels, on the Brussels and Cologne railway. The church of St. Germain, on an eminence dates apparently from the 9th c., and contains an altar-piece by Wappers. Beer and hosiery are manufactured. Tirlemont was ravaged by Marlborough in 1705; and here the French, under Dumouriez, defeated the Austrians in 1793. Pop. '70, about 12,300.

TIENOVA, a t. in the principality of Bulgaria, on the Jantra, 35 m. s.s.e. of Sistova. It was formerly the chief t. of Bulgaria; and since 1878 (see BULGARIA) it is again the seat of the chambers and the national government. There are numerous mosques, churches and synagogues; dyeing is carried on, and silk and coarse cloth are manufactured. The population is estimated at 16,000.

TIRYNS, an ancient city of Argolis, in the Peloponnesus, one of the very oldest cities of Greece, situated a short distance s.e. of Argos, near the head of the Argolic gulf. According to the common tradition it was founded by Prætus, a mythic king of Argolis; and its massive walls, like other rude massive structures in Greece of unknown antiquity, were reputed to be the work of the Cyclopes. Prætus is said to have been succeeded by Perseus; and in this place Hercules was believed to have passed his youth. At the time of the Trojan war Tiryns appears to have been subject to the kings of Argos. Some time subsequently to the battle of Plataea (to which the Tirynthians sent troops), probably about the year 468 b.c., the city was taken by the Argives, and entirely destroyed; and after this period Tiryns remained uninhabited, the walls of the citadel only being left standing, the wonder and admiration of later ages. Tiryns affords one of the most interesting specimens of what is called Cyclopean architecture, the ruins of this place, and those of the neighboring city of Mycenæ, being the grandest of all in Greece. The acropolis, or citadel, of Tiryns, was built on the summit of a low, flat, rocky hill, rising abruptly out of the dead level of the plain of Argos, and appears to have consisted of an upper and a lower inclosure of nearly equal size, with an intermediate platform. There were two main entrances, on the e. and on the s. sides, with a postern on the west. The entire circuit of the walls still remains more or less preserved; they are upward of 20 ft. in thickness, and are formed of unhewn stones of enormous size, rudely piled in tiers one above the other, without the use of mortar or cement, the interstices being filled up with smaller stones, so as to make the whole mass solid and compact. There are several covered galleries of singular construction in the body of the wall, on the e. and the s. sides, the roof being formed by sloping the courses of masonry on each side of the passage at an angle to each other. One of them has six recesses, or niches, on the outer side of the walls, intended probably to facilitate defense. Altogether, "this colossal fortress is the greatest curiosity of the kind in existence."

TI SANE, TISAN, or PRISAN, an infusion made of certain herbs, leaves, or flowers, used as tea for medicinal purposes. It is a very favorite form of remedy in the domestic medicine of France.

TISCHBEIN, JOHANN HEINRICH WILHELM, 1751-1829; b. Germany; lived for several years in Rome, and from 1790 to 1799 was director of the art academy of Naples. He then returned to Germany and settled in Hamburg. He excelled in painting scenes from animal life, but is best known by his illustrations in *Homer nach Antiken gezeichnet* (1801).

TISCHENDORF, LOBEGOTT FREDERICK CONSTANTINE VON, a very eminent Biblical scholar, was born at Lengenfeld, in Saxony, on Jan. 18, 1815. His labors in search of the best and rarest MSS. in reference to the Bible, in which he was liberally assisted by the Saxon and Russian governments, were exceedingly valuable. Among the most important of his numerous excellent works are the editions of the *Sinaitic MS.* (1862, 1863, 1865), the *Eighth Critical Edition of the New Testament* (1864-72), and the *Monumenta Sacra Inedita* (1855-70). After being an extraordinary and ordinary professor at Leipsic, from 1845, he became professor of theology and of Biblical palæography in 1859, a chair in the latter subject having been instituted for him. He was created a count of the Russian empire, an LL.D. of Cambridge, a D.C.L. of Oxford, etc. He died on Dec. 1, 1874.

TISHOMIN'GO, a co. in n.e. Mississippi, adjoining Tennessee and Alabama; drained by the Tennessee and Tombigbee rivers and their branches; traversed by the Memphis and Charleston railroad; about 530 sq. m.; pop. '70, 7,350-741 colored. The surface is hilly. The soil is fertile. The principal productions are corn, butter, tobacco, and cotton. Co. seat, Iuka.

TISSAPHERNES, a satrap of Persia. Artaxerxes II., son of Darius II., being informed by Tissaphernes of the design of his younger brother Cyrus to deprive him of the throne, put him in command of his forces, which met and defeated Cyrus at Cunaxa. As a reward he obtained in marriage the daughter of Artaxerxes, and command of the provinces of which Cyrus had been governor. Attempting to punish the Greek cities which supported Cyrus, he was defeated by Agesilaus in Lydia. Afterward proving treacherous, he was slain by order of Artaxerxes.

TISSOT, SIMON ANDRÉ, 1728-97; b. Switzerland; educated at Geneva and Montpellier, and gained a great reputation as a physician at Lausanne, in whose university he was professor. He held the chair of clinical medicine at Pavia, 1780-83. Among his works are *Historia Epidemiarum Lausaniensis Anni 1755*; *Arts au Peuple sur la Santé* (1761); and *De la Santé des Gens de Lettres suivi de l'Essai sur les Maladies des Gens du Monde*, (1768-70).

TISSUES, ANIMAL, may be either normal or pathological. The most important of these tissues have already been considered in special articles, and we shall here

merely notice the view at present most generally adopted regarding their classification (see HISTOLOGY). The normal tissues are divisible, according to Virchow and his followers, into three groups or categories. We have (1) tissues which consist exclusively of cells, when cell lies close to cell; or (2) tissues in which one cell is regularly separated from the others by a certain amount of intermediate matter, or intercellular substance; or (3) tissues in which the cells have attained specific, higher forms of development, by means of which their constitution has acquired an entirely peculiar type. As illustrations of the first group of tissues, the simple cellular tissues in the modern sense (cellular tissue here being quite distinct from areolar or connective tissue), we may take the epithelial formation, such as occur in the epidermis and the nails, and in the epithelium of mucous and serous membranes, in the crystalline lens of the eyes (which is originally a mere accumulation of epidermis), and in the glands. The second group is formed by the connective tissue, which is composed of intercellular substance, with cells of various forms embedded in it, and includes cartilage, fatty tissue, etc. In the third group, which is somewhat heterogeneous, the structures are usually more or less tubular. This group includes the muscles, nerves, and vessels, and Virchow also places the blood in it. Such an arrangement as this is quite distinct from, and altogether at variance with, those adopted a comparatively few years ago. This arrangement has reference to general histology (*tissues*, properly so called), while *that* has reference to special histology, or the structure of organs in which a combination of various tissues may enter. Thus, the *osseous tissue* of general histology consists of bone cells + calcified intercellular substance, while *bone as an organ* consists of osseous tissue + medullary tissue + periosteum + vessels + nerves; similarly, nervous tissue is by no means identical with cerebral matter, which additionally contains membranes, vessels, etc.

Morbid tissues may be classified upon exactly the same plan as the physiological or normal tissues. The belief is gradually extending that there is nothing peculiar or specific in pathological structures, or, in other words, that every pathological tissue has its physiological prototype, and that "no form of morbid growth arises which cannot in its elements be traced back to some model, which had previously maintained an independent existence in the economy."—Virchow's *Cellular Pathology*, translated by Chance, p. 60. The distinguished pathologist whose words we have just quoted maintains that there is no other kind of heterology in morbid structures than the abnormal manner in which they arise, and that this abnormality consists either in the production of a structure at a point where it has no business, or at a time when it ought not to be produced, or to an extent which is at variance with the typical formation of the body; "but," he adds, "practical experience shows us that it would be altogether incorrect to conclude from the mere correspondence of a pathological tissue with a physiological one that the case would continue to follow a benignant course." The curious bodies provided with large nuclei and nucleoli, which have been described by many pathologists as "the specific polymorphous cells of cancer," are merely irregularly developed epithelial cells, such as occur, for example, in the lining of the urinary passages; and the apparent heterology of other morbid growths may be similarly explained.

TISSUES, VEGETABLE. See CELLULAR TISSUE, VASCULAR TISSUE, and VEGETABLE TISSUES.

TIT, or TITMOUSE. *Parus* a genus of birds of the order *insectivores*, tribe *corvirostris*, and family *paridae*. The *paridae* are small birds, of which there are more than 50 known species, widely distributed throughout Europe, Asia, Africa, and North America. They are more numerous in cold and temperate than in tropical regions, those which are found within the tropics being mostly inhabitants of elevated mountainous districts. The bill is small, short, somewhat conical, the tip entire, the base beset with hairs, and the nostrils generally concealed by feathers. The wings are not very long, but are pointed; the tail is rounded or even; the tarsi long, slender, scaled in front, the inner toe shortest, the claws long and curved. The plumage is beautiful, often gay. The popular name tit and titmouse are very generally given to all the *paridae*. They are bold sprightly birds, extremely active, flitting from branch to branch, running rapidly along branches in quest of insects, and often clinging to the under-side of branches with their back downward. They feed not only on insects but on grain and seeds, have no objection to carrion, and sometimes kill young and sickly birds by strokes of their bill. They are very pugnacious, and the female tit shows great courage in defense of her nest, often continuing to sit when the nest is approached, and vigorously assailing the intruding hand with her bill. In winter many of the species gather into small flocks, and approach houses and villages, competing with sparrows and chaffinches for a share of the food of domestic poultry. Most of the tits lay at least six eggs, some of them twelve or more, and even in temperate countries they often produce two broods in a year. They generally build in trees. The young are fed chiefly on caterpillars. A pair of blue tits have been observed to carry a caterpillar to their nest, on an average, every two minutes during the day, so that these birds must be extremely useful in preventing the multiplication of noxious insects. Seven species are found in Britain, but one of them, the **CRESTED TIT** (*parus cristatus*) is a mere accidental visitor. The **GREAT TIT** (*P. major*) is the largest European species. It is common in almost all parts of Europe. It is not quite six inches long; the head and throat are black; the cheeks are

white; the back, breast, and sides yellowish; the wings and tail grayish. Its usual note is a kind of chatter, but it sometimes imitates the notes of other birds. The BLUE TIT (*P. caruleus*) and the COLE TIT (*P. ater*) are very common in Britain. The blue tit is perhaps the most pert and audacious of all the British species. It very generally receives the familiar name of *tomtit*. The upper part of the head is light blue, and a bluish tinge prevails in the plumage. The LONG-TAILED TIT (*parus caudatus*), common in Britain, has the tail about as long as the body. Its head is white, contrasting beautifully with the deep black of the back; the tail is also black, with white edges. The nest of this bird is a beautiful structure, of moss and wool externally covered with lichens, and profusely lined with feathers, nearly oval, with a small hole in the upper part of one side. Still more interesting is the nest of the PENDULINE TIT (*ægithulus pendulinus*) of the s. of Europe, which in form resembles a flask, and is generally suspended at the end of a flexible twig, in a situation near to or overhanging water. It is nicely woven of fibers of bark and the down of willow or poplar catkins, and the opening is in the side. The CHICKADEE or BLACK-CAP TIT (*parus atricapillus*) is very common in North America. The TUFTED TIT (*lophophanes bicolor*) is the largest American species. See CHICKADEE.

TITANIUM (sym. Ti, eq. 25—new system, 50—sp. gr. undetermined) is a comparatively rare metal, which, according to the method by which it is procured, occurs as a gray, heavy, iron-like powder, which burns with brilliant scintillations in the air, and is converted into titanic acid, or in prismatic crystals. At 212° it decomposes water, and it is soluble in hydrochloric acid. It is obtained in the crystalline form by heating sodium in the vapor of bichloride of titanium. It never occurs native, but is found in association with other elements in various minerals, of which the most important are *anastase*, *rutile*, and *brookite*, containing titanic acid; *titanite*, containing silicate of lime and titanic acid; *perovskite*, containing titanite of lime; *æschynite*, containing titanic and niobic acids, and the oxides of cerium and lanthanum; and lastly, *titanic iron*, composed of titanate of protoxide of iron. A remarkable artificial compound of the metal is often found in the form of copper-colored cubic crystals, adhering to the slags of iron furnaces. They are hard enough to scratch agate; and no acid except a mixture of nitric and hydrofluoric acids has any action on them; but they are volatile at an extremely high temperature. They consist of a combination of cyanide with nitride of titanium, and are represented by the remarkable formula, TiCy_3TiN . The most important compound of this metal is *titanic acid* (TiO_2), which occurs in the minerals *menaccanite* and *iserine*, as titanate of iron, but is more common in the uncombined state, as titanic anhydride, in the form of *rutile*, *brookite*, and *anastase*, each of which possesses a distinct crystalline form, and has a different specific gravity. Hence titanic acid in the anhydrous state is trimorphous. It is usually obtained by a somewhat complicated process from *rutile*. Titanium was discovered by Gregor, as a constituent of *menaccanite*, in 1791.

TITANOSAURUS, or **ATLANTOSAURUS**, a genus of extinct reptiles belonging to the order *Dinosauria* (q.v.), and therefore allied to *hadrosaurus* (q.v.), *megalosaurus* (q.v.), and *iguanonodon* (q.v.). Their fossils are found in the Jurassic formations of North America. The *Atlantosauros montana* from Colorado, according to prof. Marsh, "is by far the largest land animal yet discovered; its dimensions being greater than was supposed possible in any animal that lived and moved upon the land. It was some 50 or 60 ft. in length, and when erect, at least 30 ft. in height. It doubtless lived upon the foliage of the mountain forests, portions of which are preserved with its remains." The *chondrosteosaurus* was rather longer, but it was semi-aquatic in its habits.

TITANOTHE RIUM, an extinct genus of mammals from the "bad lands" of White river of Dakota, probably of the miocene formation. They were discovered by Dr. H. A. Prout, and named by Dr. Leidy *titanotherium proutii*. They belong to the extinct family *brontotheriide*, which includes as many as four genera, *titanotherium*, *megacerops* (q.v.), *brontotherium*, and *diconodon*. The best known genus is *brontotherium*, having the following characteristics: skull long and depressed, resembling that of the rhinoceros; large horn cores in front of the orbits, on the maxillary bones, and having large air cavities, nasal bones large and firmly ossified together; occipital condyles large and widely separated; dental formula; $i' \frac{2-2}{2-2}; c \frac{1-1}{1-1}; pm \frac{4-4}{3-3}; m \frac{3-3}{3-3}$. Upper incisors small; canines short and stout with no diastema between them and the molars. The upper molars are large grinding teeth, often measuring 5 in. in diameter; brain cavity small in proportion to the skull, the cerebral hemispheres not extending over the cerebellum, and only to a small extent over the olfactory lobes; hemispheres comparatively large and much convoluted; cerebellum small, indicating clumsiness in motion; atlas or first cervical vertebra large and having great transverse extent; axis large, with massive odontoid process; lumbar vertebrae smaller than dorsal. There were four sacral vertebrae, and the caudal bones indicate a long and slender tail; limbs intermediate between elephant and rhinoceros; carpal bones shorter than in rhinoceros, supporting four stout toes, radius and ulna, and also tibia and fibula, separate; *os calcis* long, astragalus short. The hind feet had three toes of nearly equal size. None of the bones of the skeleton were hollow; nose probably flexible and tapir like, and not a true probosc-

cis. These animals nearly equaled the elephant in size. The fossils of *brontotherium* are all as far as known from miocene beds of Dakota, Nebraska, Wyoming, and Colorado. Prof. Marsh, who discovered these extinct forms in these regions, remarks that the name *titanotherium* must give way to the previously applied name *menodus*.

TITANS AND TITANIDÆ (originally called *Ouraniones*, celestials), in Greek mythology, were the sons and daughters of Uranus (heaven) and Gea (earth). Their names, as commonly given, were: Oceanus, Cœus, Crius, Hyperion, Iapetus, Kronos, Theia, Rhea, Themis, Mnemosyne, Phœbe, and Tethys; Dione, Phorcys, and Demeter are added by some writers. Instigated by their mother, the Titans, headed by Kronos, rose against their father, emasculated and deposed him, and liberated their brothers the Hecatoncheires (hundred-handed) and the Cyclopes (q.v.) from Tartarus. Kronos being made king, threw the Cyclopes back again to Tartarus, and married his sister Rhea. In order to escape being deposed by one of his own children, as it was foretold he would be, Kronos swallowed each as it was born. Rhea, when she gave birth to Zeus (q.v.), saved his life by giving a stone wrapped in a cloth to Kronos, who swallowed it, believing it to be his child. Zeus, when he grew up, gave his father a potion which caused him to vomit the stone and the children he had swallowed. Assisted by his brothers and sisters, along with the Cyclopes and Hecatoncheires, Zeus began with the Titans the ten years' conflict which resulted in the complete triumph of the former and the overthrow of the latter, who were hurled down into a dungeon below Tartarus, surrounded by a brazen wall, and guarded by the Hecatoncheires. During the war Zeus and his allies occupied mount Olympus in Thessaly, his opponents being encamped on mount Othrys. The name Titan is also given to the descendants of the Titans, such as Prometheus, Hecate, Helios, Selene, etc.

TITE, Sir WILLIAM, 1802-73: b. London, England; studied architecture under Laing. His first work was the rebuilding of the church of St. Dunstan's-in-the-East in the Gothic style. This at once established his fame. Among his best designs was that of Edward Irving's church in London. In 1855 he was returned to parliament from Bath as a liberal, and was made a member of the banking committees. His title was bestowed in 1869. In 1848 he published a catalogue and description of the antiquities found in the excavations for the royal exchange, of which he was architect.

TITHES (A. S. *teotha*, a tenth; Lat. *decima*, i.e., *pars*, a tenth part), the tenth part of the produce of the land, which, by ancient usage, and subsequently by law, is set aside for the support of the clergy, and other religious uses. This provision for the clergy passed at a very early period from the Jewish into the Christian church, and indeed the same or some analogous appropriation has been traced in the other ancient religions. It is observable under the patriarchal system in the words employed by Jacob (Gen. xxviii. 22), and in the offering of Abraham to Melchisedec (Gen. xiv. 20); and mystical reasons have been devised for the selection of the tenth part, rather than any other fractional portion of the produce of the earth, to be consecrated to the uses of religion and the ministers of religion. (See Spencer, *De Legibus Hebræorum*, iii. 1 to 10.) The details of the institution among the Jews will be found in Levit. xxvii., Deut. xiv., and many other places. The tribe of Levi not having lands assigned, as was the case with the other tribes, drew their support from this impost.

In the Christian dispensation the very circumstance of the existence of the clergy as a distinct class supposed a certain fixed provision for their maintenance. The necessity of such provision, and the right on which it is founded, is distinctly expressed in many passages and allusions of the New Testament, as Matt. x. 10, Luke x. 7, Rom. xv. 27, 1 Cor. ix. 7 to 14. The obligation in the general sense which these passages involve has been put forward in ecclesiastical legislation from the earliest period. The apostolical canons, the apostolic constitutions, St. Cyprian on *The Unity of the Church*, and the works of St. Ambrose, St. Chrysostom, St. Augustine, and the other fathers of both divisions of the church, abound with allusions to it. As yet, however, this obligation was discharged mainly in the form of voluntary offerings; and the legislation of the first Christian emperors, while it presupposed the duty of maintaining the clergy, and even assigned lands and other property for their support, did not extend to any general enactment for the payment of the tenth of the produce of the lands. The council of Tours, 567 A.D., the second council of Macon, 585, that of Rouen, 650, of Nantes 660, of Metz, 756, and some others, distinctly sanction that form; and at length Charlemagne by his capitularies formally established the practice within those portions of the ancient Roman empire to which his legislation extended.

From this and other sources the payment of a tenth to the church extended throughout western Christendom. By some the claim was held to be of divine law; by others, of human institution; but in the gradual progress of relaxation it came to pass that the right thus established solely for the church began to be usurped for themselves and for purely secular uses by nobles or other powerful laymen. See **IMPROPRIATION**.

The first introduction of tithes into England is ascribed to Offa, king of Mercia, in the close of the 8th century. The usage passed into the other divisions of Saxon England, and was in the end made general for all England by Ethelwulf. It would seem that, at first, although all were required to pay tithes, it was optional with each to select the church to which his payment should be made; but by a decretal of Innocent III.,

addressed to the archbishop of Canterbury in 1200, all were required to pay tithes to the clergy of their respective parishes, and this parochial distribution of tithes has ever since obtained in England. The ancient canon and civil law distinguishes many varieties of tithes, into which we shall not enter, as royal, indominate, fiscal, salic, etc. We shall confine our remarks to the provisions of the English law, premising that in most respects it is founded upon the general principles of the civil and canon law.

Tithes are of three kinds—*predial*, *mixed*, and *personal*. Predial tithes are those which arise immediately from the earth itself, as of grain of every kind, fruits, and herbs. *Mixed* tithes are those proceeding from things nourished by the earth, as calves, lambs, pigs, colts, chickens, milk, cheese, eggs, etc. *Personal* tithes are those arising from the profits of personal industry, in the pursuit of a trade, profession, or occupation; but it is commonly held that personal tithes were ordinarily paid in the form of a voluntary offering at Easter or some other period of the year. From these explanations, it will be understood that no tithe was due from the proceeds of mines or quarries, as their produce is not the result of any growth or increase of the earth, but forms part of its substance; nor from houses, as having no annual increase. The common law, moreover, held wild animals, game, fish, etc., not to be proper subjects of tithe, as also tame animals kept for pleasure or curiosity, and not for profit or use.

A more arbitrary distinction is into *great* and *small* tithes, the first being tithes of corn, hay, wood, etc.; the second being the other kinds of predial tithes, as well as all personal and mixed tithes. This distinction, although purely arbitrary, is important, inasmuch as the great tithes of a parish belong to the rector (q.v.), and the small tithes to the vicar (q.v.). Tithes were originally paid "in kind;" that is, by the actual numeration of the products of the land, and the apportionment in each of the numerical tenth part, as of the tenth sheaf, the tenth lamb, calf, etc. The inconvenience and trouble, as well as the unsettled and variable quantities involved in this mode of payment, led to early attempts to provide other modes of apportioning the result (the particular manner being called technically a *modus decimandi*, or simply a *modus*). This was done either by making an agreement to pay a fixed quantity irrespective of actual produce in each year, or by a money payment settled between the parties; or by a partial substitution of payment or labor, as when the party contributed a smaller quantity of produce, but free from the expense of harvesting, carriage, etc.; or finally, by a payment of a bulk sum in redemption of the impost, either for a time or forever, as the case might be, in which case the land so redeemed became temporarily or permanently tithe-free. By such compositions, many lands in England were made anciently tithe-free, and have so continued; but by 1 Elizabeth 19, and 13 Elizabeth 10, such alienations of tithe-payment were restricted to a term of twenty-one years, or three lives.

Besides the exemption from tithe thus created, a still more comprehensive occasion of immunity is traceable to the exemption enjoyed by the lands of religious houses. Originally, convents occupying lands in England paid tithes like other land-owners to the parochial clergy; but a decretal of Paschal II. exempted them from such payments in regard to lands held by themselves in their own occupation. This exemption was confirmed by subsequent legislation to the four orders—templars, hospitaliers, Cistercians, and præmonstratensians, and after the 4th council of Lateran (1215), only in respect of lands held by them before that year. Frequently, however, exemptions were given in favor of particular houses; and in cases in which religious communities were themselves the incumbents of a parish, as they could not pay tithes to themselves, their own lands within such parish became exempt by what was called "unity of possession." And thus it came to pass that a large extent of land in England and Wales was held free of tithes. Now, when, on the suppression of monasteries, those lands were assigned to lay possessors, they passed of course into lay hands with the same immunity; and hence this exemption from tithe has become perpetual even in the hands of lay possessors, as, on the other hand, by a similar transfer, lay proprietors have in many instances acquired the right to tithe, and the property of many rectories.

The arrangements between parties for commuting the mode of payment, to which allusion is made above, were permitted, and even protected by law; but they were nevertheless purely voluntary and partial, and the perpetually recurring contests to which the system led, as well as the oppressive nature of the exaction when the parties from whom it was claimed did not belong to the church established by law, rendered the impost odious; and in Ireland it became impossible to enforce its collection in great part of three of the four provinces. A measure of commutation became absolutely necessary. This had been recommended by committees as far back as 1822, but it did not pass into law until 1838. Various statutes for England or Ireland have since been enacted regulating the payment of tithe—6 and 7 Will. IV. c. 71, 7 Will. IV. and 1 Vict. c. 69, 1 and 2 Vict. c. 64, 2 and 3 Vict. c. 32, and 5 and 6 Vict. c. 54. Their object for England is to substitute a money rent-charge, varying on a scale regulated by the average price of corn for seven years, for all the other forms of payment. This commutation may either be voluntary, or may be effected by the tithe commissioners, according to a valuation. Land not exceeding twenty acres may be given by a parish in commutation of tithes; but only in the case of ecclesiastical persons, and not of lay impropiators. Similar arrangements have been made in those few Catholic countries in which tithes still continue to be paid.

In Ireland the settlement was effected by a general commutation of tithe into a money rent charge, regulated by a valuation of the tithes (one-fourth being deducted for the cost of collection), and payable by the proprietors, who should receive it from the occupiers of the land. By the Irish church act (32 and 33 Vict. c. 42), this rent-charge became vested in the commissioners of church temporalities, with power to sell such rent-charge to the owner of the land charged therewith at $22\frac{1}{2}$ years' purchase. Power is also given to such purchaser to pay by installments for 52 years, at the rate of $4\frac{1}{2}$ per cent on the purchase-money, deducting the estimated charge for poor-rate; the rent-charge being extinguished at the expiration of the 52 years.

TITHING, an ancient Saxon division of the country, consisting of the tenth part of a hundred, being occupied by ten families, each of whom was responsible for the good behavior and peace of the rest. The institution has been long growing obsolete, and the police constables (q.v.) now supersede the officer called a tithing-man.

TITHONUS, son of Laomedon, brother of Priam, and spouse of Eos, the goddess of morn. The story is that Eos, in asking immortality for her spouse, forgot to ask at the same time eternal youth, so that in his old age he became completely shrunk and decrepit, whereby his "cruel immortality" was rendered a burden to him.

TITIAN, or **TIZIANO**, **VECELLI**, the head of the Venetian school, and one of the greatest painters that ever lived, was b. of a good family at Capo del Cadore, in the Friulian Alps, in the year 1477, or, according to some, in 1480. His predilection for drawing caused his father to send him to Venice at the age of ten, that he might learn to be a painter. His instructors were Sebastiano Zuccati and the two Bellinis, particularly Giovanni; but the painter that exercised the greatest influence on his style was Giorgione (q.v.). So vivid and keen was his appreciation of the distinctive features of any artist's work, that he never failed to reproduce them with striking fidelity, and even to leave the impression that he had beaten the master whom he imitated, in his own style. It was owing to this irrepressible superiority that the friendship between Giorgione and him was interrupted. The first work that brought Titian prominently into notice was his completion of the "Homage of Frederick Barbarossa to Pope Alexander III." (1512), begun by Giovanni Bellini, but left unfinished by that artist at his death. The Venetian senate, who had commissioned the piece, were so much pleased with Titian's performance, that they conferred on him an office with an annual salary of 300 crowns. In 1514 he painted a "Bacchus and Ariadne," and other works of a similar kind, for the duke of Ferrara, a portrait of the duke himself, and of the lady who afterward became his wife, besides a picture of the "Tribute-money." While residing at the court of Ferrara, he made the acquaintance of the poet Ariosto, who sat to him for his portrait. On his return to Venice he painted an "Assumption of the Virgin," one of his grandest achievements. His reputation now rapidly rose. Pope Leo X. and Raphael both invited him to Rome, and Francis I. to France; but he declined. During 1520-30 the most celebrated of his numerous productions were—"St. Peter, Martyr," a work of unsurpassable beauty; "Victory of the Venetians over the Janizaries;" and "St. Sebastian." In 1530 his friend Aretino (q.v.), the poet, introduced him to the notice of the emperor Charles V., whose portrait he painted at Bologna, and who gave him several other commissions. From Bologna Titian proceeded to Mantua, where he executed a great number of works for duke Frederico Gonzaga. In 1532 he appears to have accompanied Charles to Spain, where he remained for three years, and painted several of his masterpieces, now found in that country. In 1537 he executed an "Annunciation;" in 1541 a "Descent of the Holy Ghost upon the Apostles," a "Sacrifice of Abraham," "David and Goliath," and a "Death of Abel;" and in 1543 pictures of the "Virgin," and "San Tiziano," and portraits of pope Paul III., cardinal Farnese, and duke Octavio Farnese, at Rome, where he remained three years. The emperor Charles V., who greatly admired his genius, twice called him to Augsburg (1547 and 1550). Among the religious works which he executed for Philip II. of Spain are a "Last Supper," "Christ in the Garden," "St. Margaret with the Dragon," and a "Martyrdom of San Lorenzo;" besides these we notice a "Venus and Adonis," a "Danaë," a "Medea and Jason," and other classic subjects. A complete catalogue of Titian's works does not exist, but the number known is extraordinarily great—upward of 600. Titian died of the plague in 1576, having attained the extreme age of 99. He is best studied at Venice or Madrid, but splendid specimens of his work are to be seen in the chief European galleries. As already observed, he had at first a tendency to reproduce the style of acknowledged masters, but his genius soon emancipated itself from all imitativeness, and displayed a glorious originality and power. The luxury of light did never so enrich a painter's canvas. This is, indeed, his transcendent excellence. Not inaccurate in design, not sterile in invention, not infelicitous in composition—these, his minor merits, are nevertheless wholly thrown into the shade by the splendor, boldness, and truth of his coloring, which alone has sufficed to give him a place alongside the greatest names in art, Raphael, Leonardo da Vinci, and Michael Angelo.—See Hume's *Notices of the Life and Works of Titian* (Lond. 1829); Northcote's *Life of Titian* (Lond. 1830); and *Titian, his Life and Times*, by Crowe and Cavalcaselle (Lond. 1876).

TITICA'CA, LAKE. See PERU.

TITLARK AND **TITLING**. See PIPIT.

TITLE, REGISTRATION OF, in England, is a modern experiment, set on foot after long-continued opposition, and still frowned on by the solicitors, who conceive that its operation will be to reduce their emoluments. Owing to the total want which had always existed of a register for deeds or writs connected with the transfer of land, except in the counties of Middlesex and York, the complexity and uncertainty attending the operations of conveyancing had long been the opprobrium of English law, and the mercantile classes at last called for a remedy by which an acre of land might be sold with the same expedition and certainty as bank stock. Under the system referred to, so far from expedition being a feature of conveyancing, delay, expense, and insecurity were the chief characteristics. It was till 1874 the inveterate practice for a purchaser of land to demand, and for the vendor to give, what is called a sixty years' title—i.e., he must show the successive owners for sixty, and since 1874 for forty years previous to the sale, and all that these owners did in connection with it. This created great expense and delay. But if the property were sold next month, or next day, precisely the same process had to be repeated between the new purchaser and his vendor, for what might have been done between other parties previously was not binding, nor was it safely to be acted on by their successors in the property. These evils called loudly for some remedy, and of late years all the legal reformers have been busy with projects to provide some relief. An important impetus was given to, reform by the passing of the Irish incumbered estates act in 1848, the object of which was to break up and compel a sale of the deeply incumbered estates of Ireland. In 1854 a similar statute was applied to the estates of the West India islands. In 1862 two acts passed for establishing in England a land registry, 25 and 26 Vict. 53, 67, for registering indefeasible titles, but they were confined to good marketable titles. Land of the value of about £6,000,000 had been registered under those acts of 1862, when a more elaborate scheme was prepared by the land transfer act, 1875, 38 and 39 Vict. 87, which greatly amplified and matured the previous efforts in the same direction. The office of land registry is conducted by a registrar, appointed by the lord chancellor, who must be a barrister of ten years' standing. He has assistants and clerks. The office has a seal and various forms to be used in connection with the business. The fees are all fixed by the lord chancellor and the treasury, and these are paid by means of stamps. Power is also given by the act to create hereafter district registries. And it is provided that any land situated in Middlesex and Yorkshire, two counties which already had land registries, should, if registered under the new act, be exempt from the jurisdiction under the local acts, it being contemplated that the general law now established will gradually supersede the former local machinery.

Under the land transfer act, 1875, any person who has contracted to buy freehold land, or any owner or any person having power to sell it, may apply to the registrar to be registered, with an absolute title or with a possessory title only. In case of a purchaser applying the vendor must consent. The registrar must approve of the title submitted, and in case of a sale the vendor and his solicitor must make an affidavit that they have produced all the deeds, wills, instruments of title, and all charges and incumbrances affecting the title, as well as all facts material. The registrar can also compel third parties to produce deeds relating to the land. If doubtful questions as to law or fact arise in reference to it, the registrar may refer a case for the opinion of the high court of justice; and that opinion will be conclusive, because all parties having any possible interest are fully heard by the court. The freehold absolute title will show all incumbrances on such land, and other rights which the act declares not to be incumbrances. The possessory title does not prejudice the enforcement of adverse rights which exist at the time of registration, but in other respects it has the same effect as the absolute title. Leasehold lands may also be registered, and they are registered in a separate register. When once the title is registered no adverse title will acquire any advantage by length of possession. The registered proprietor can by a simple form charge or burden the land with a payment of a sum of money at an appointed time. When the registered land is sold the transferee's name is entered on the register, and a land certificate given to him. Any person claiming on adverse interest may lodge a caution having the effect of entitling him to notice of all future dealings with the property if registered, or he may lodge a like caution against the land being registered at all. No notice of a trust is to be entered on the register, and a trustee selling land may authorize the purchaser to be registered as the first proprietor. The land transfer act is not compulsory, but it was expected that it would gradually become generally accepted when the simplicity it secured for titles came to be better known.

TITLE, REGISTRATION OF (*ante*), in law, confined usually to real estate, has been defined as "the means whereby the owner of a real estate in real property acquires his right of property, his right of possession, and his actual possession." The title may be by descent or by purchase, the latter term being used to include all methods of acquisition except that by descent. Title by purchase may be by grant or by devise, by operation of the law, or by act of the parties. The various modes by which title may be acquired by act of law are described under the topics ABANDONMENT, ESCHEAT, FORFEITURE, PRESCRIPTION, MARRIAGE, EXECUTION, and EMINENT DOMAIN. Grants may be private or public; the former are by deeds, for consideration *valuable*, as money; or *good*, as

affection, and the deed must be signed, sealed, and delivered; in many states the signature must be attested and acknowledged before a magistrate. As to registration, see RECORD OF CONVEYANCES. Title by public grant in this country is that acquired in real property previously belonging to the government of the United States or one of the states. The fee simple of all unsold lands is in either the general government or the states, and is parted with by an instrument called a patent, the terms of which (unless there has passed some consideration), are construed in favor of the government as against the patentee.

TITLE-DEEDS are the evidences of ownership of real property in this country. Each owner is supposed to be in possession of his own, either by himself or his solicitors; and the ownership of the title-deeds passes along with that of the lands themselves. In England there is no general register, except in Middlesex and Yorkshire, and elsewhere to the extent allowed under the land transfer act. It is a dangerous thing to part with title-deeds, for, by merely pledging them as a security for money a mortgage may be created over the lands. In Scotland there is a general register where all title-deeds may be kept, or authentic copies, so that the loss of one may be replaced without much difficulty.

TITLES OF HONOR, designations to which certain persons are legally entitled, in consequence of possessing particular dignities or offices. King and emperor are titles of honor belonging to the sovereigns of different countries; and your majesty is the form of address to which, by the usage of most European countries, they are entitled. Your grace was in England, in former times, the usual mode of addressing the sovereign. The epithet majesty, taken from the *majestas* of the emperors of Rome, was adopted by the emperors of Germany, who considered themselves their successors; but its use by other European sovereigns is of comparatively recent date. Henry VIII. was the first king of England, and Henry II. the first king of France, who adopted it. Your highness is the style adopted by the sultan of Turkey. The proper style of the reigning sovereign of the United Kingdom is, "Victoria, by the grace of God, of the United Kingdom of Great Britain and Ireland, queen, defender of the faith." The sons of the sovereigns of England are styled princes, and their daughters princesses; and the sovereign's eldest son is prince of Wales (q.v.). The title of royal highness is given to all the children of the sovereign, and by letters-patent under the great seal in February, 1864, her majesty declared her pleasure that the children of the sons of the sovereign should also enjoy the same title. The different grades of the peerage have their several titles—duke, marquis, earl, viscount, and baron—each of which was in its origin a name of office involving certain specific duties. See FORMS OF ADDRESS, COURTESY TITLES.

Though most European countries have their dukes, marquises, counts, viscounts, and barons, these often differ considerably in rank from the seemingly corresponding titles in Britain, and the English rules and practices regarding title are not applicable abroad. The complicated system of titles by law, and still more by courtesy, which prevails in England, is a source of endless perplexity to such foreigners as endeavor to make themselves acquainted with our usages.

TITMOUSE. See **TIT**, *ante*; **CHICKADEE**.

TITULAR one who enjoys the bare title of an office, without the actual possession of that office. Thus, the English kings styled themselves kings of France from the time of Henry IV. down to the year 1800; and previous to the recent changes in Italy, the king of Sardinia, as well as the king of Naples, was titular king of Jerusalem. In English ecclesiastical law a titular is a person invested with a title, in virtue of which he holds a benefice, whether he performs its duties or not. In the law of Scotland the term has received another acceptance. When the king, at the reformation, became the proprietor of all church lands, he erected the monasteries and priories into temporal lordships, and bestowed them on laymen, who were known as lords of erection, or titulars; this latter name indicating that they had the same title as had formerly been possessed by the religious houses to the lands and tithes. See **TENDS**.

There are many titular dignities in the Roman Catholic church; but the class of them which is chiefly noticeable is that which has grown out of the separation between the eastern and western churches. It is well known that the Roman pontiff, notwithstanding the schism, claims to retain authority over the entire extent of Christendom; and even where there is not any longer resident within the limits of an ancient church or province a body of Christians of the Roman communion, the pope claims to appoint an ecclesiastic to be bishop, metropolitan, primate, or patriarch of the ancient see (see **IX PARTIBUS INFIDELIUM**). In England, and still more in Ireland, where archbishops and bishops of the Roman Catholic church exist *de facto*, but not *de jure*, they are styled titular.

TITUS, a co. in n.e. Texas; drained by the Sulphur fork of the Red river; and by White Oak and Cypress bayous; 900 sq. m.; pop. '80, 5,959—1358 colored. The surface is level. The soil is fertile. The principal productions are corn, cattle, cotton, and potatoes. Co. seat, Mount Pleasant.

TITUS, a companion of Paul in the embassy from Antioch to Jerusalem and in his next missionary journey to Asia Minor and Macedonia; was twice sent as a confidential

messenger to the church of Corinth. - Having been associated with the apostle in preaching the gospel in Crete, he remained some time there having charge of the churches. Afterward they met at Nicopolis, a city of Epirus, and Titus having then been sent into Dalmatia, does not again appear in Scripture. Nothing more concerning him is certainly known.

TITUS, EPISTLE to, one of the three "pastoral epistles," was written by St. Paul, probably in the latter part of his life, and after he had been liberated from his first imprisonment at Rome. From the 12th verse of chapter iii., we learn that the apostle was staying at Nicopolis when he wrote the letter, and the subscription identifies this place with Nicopolis of Macedonia; but this is impossible, for, as De Wette notices, that city appears to have been founded by the emperor Trajan long after St. Paul was dead. Jerome's opinion is probably the correct one, that the Nicopolis referred to was the famous city in Epirus. The epistle concerns itself mainly with the organization and discipline of the church in Crete, is very practical, and at times unpleasantly sharp in its tone, as if Paul had felt more acutely than usual the vexations which "unruly and vain talkers and deceivers, *specially they of the circumcision*," caused him. Above all things, however, he is nobly solicitous that the Christians of Crete should prove the sanctifying power of their new faith by rising superior to the immoral practices of heathenism. See the Commentaries of Chrysostom, Jerome, Aquinas, Luther, Melancthon, Calvin, Cocceius, Grotius, Rosenmüller, De Wette, Alford, Wordsworth, Ellicott, etc.

TITUS, EPISTLE to (*ante*), written by Paul to instruct and encourage Titus in the difficult work of guiding the newly formed church in Crete. The natural character of the people was unsteady and quarrelsome. They were greedy, licentious, false, and given to strong drink; and the Jews who had settled among them were even worse than the natives. Among such a people Titus had been left to carry on the work of establishing Christianity. Hence Paul addressed this epistle to him, adopting in it a sharpness of style which critics consider unusual. First he enlarges on the qualifications of church officers, and on the vices from which they must be free. He then describes the virtues which should adorn old persons, women, the young, servants, and Christians generally. In the third place he commands obedience to civil rulers; commands moderation and gentleness; and condemns all idle and vain speculations. He finally urges Titus to join him at Nicopolis and adds loving salutations and benedictions.

TITUS FLAVIUS SABINUS VESPASIANUS, Emperor of Rome, was the eldest son of Vespasianus (q.v.) and Flavia Domitilla, and was born at Rome, Dec. 30, 40 A.D. Brought up at the court of Nero along with Britannicus, the son of the emperor Claudius, he received an excellent training both of body and mind, became an adept in many exercises, and an accomplished scholar; and subsequently, as *tribunus militum* in Germany and Britain, and commander of a legion in Judea under his father, proved his qualities as a soldier and a general. On his father's elevation to the imperial throne, Titus was left to prosecute the Jewish war, which he brought to a close by the capture of Jerusalem after a long siege. The news of the success was received with the utmost joy, and Vespasian's too suspicious temper was awakened. However, Titus by returning to Rome, and laying the trophies of victory at the emperor's feet, removed his unfounded jealousy, and father and son obtained the honor of a joint triumph (71 A.D.). About this time Titus became his father's colleague in the empire, and the impression which the conduct of the young conqueror made upon the Roman people was, and with just reason, very unfavorable. He gave himself up to the pursuit of pleasure in all its forms, put to death various suspected persons very summarily, and even caused one of his guests, whom he justly suspected of conspiracy, to be assassinated as he left the palace. His *liaison* with Berenice, the daughter of Herod Agrippa I. (q.v.), was also very distasteful to the Romans; and on the death of his father (79 A.D.), whom he was at that time believed by a few to have poisoned, the Romans had satisfied themselves as to the advent of a second Nero. But Titus's behavior after his hand grasped an undivided scepter completely belied their anticipations. The very first act of his reign was to put a stop to all prosecutions for *lesa majestas*, which had abounded since the time of Tiberius (q.v.); informers were scourged in the forum, dragged along in front of the theaters, and then either sold as slaves or banished. The ancient and venerated buildings of Rome were repaired; new ones, as the Colosseum (see AMPHI-THEATER) and the baths which bear his name, were erected; and the prominent tastes of the populace were abundantly gratified by games on the most stupendous scale, which lasted for 100 days. Titus's beneficence was unbounded, and it so happened that during his brief reign there was the most urgent need of his exercise. In 79 A.D. occurred the eruption of Vesuvius, which overwhelmed Herculaneum and Pompeii, and ruined numerous other towns and villages; in 80 A.D., a fire broke out in Rome, which raged for three days, destroying the capitol, Augustus's library, Pompey's theater, and numerous houses; and in the tracks of these calamities followed a dreadful pestilence. Titus dealt out gifts with lavish hand to the houseless and ruined sufferers; he even despoiled his palaces of their valuable ornaments, to obtain money for distribution, and schemed and planned to furnish occupation for them. He was now the idol of his subjects, the "love and delight of the human race;" but, unfortunately for that part of the human race over which he ruled, in the commencement of the third year of his reign he became suddenly ill, and

died at his patrimonial villa in the Sabine country (Sept. 13. 81), not without the suspicion that he had been poisoned by Domitian, his younger brother.

TITUSVILLE, a city in Crawford co., Penn.; on the n. bank of Oil creek, 18 m. e. of Oil City, 40 m. s.e. of Erie, on the Pittsburg, Titusville and Buffalo, and the Dunkirk, Alleghany Valley and Pittsburg railroads; pop. '80. 10,000. The city was incorporated in 1867, has good pavements, is lighted with gas, and supplied with water by the Holly waterworks system. The discovery of petroleum in this vicinity in 1859, and the boring of oil wells, have caused the great growth of the city. It has numerous oil refineries, producing 4,000 barrels of refined petroleum per day; cooper shops averaging 3,000 barrels daily; and manufactories of engines, boilers, iron tanks, stills, brass castings, oil-well pumping and boring tools, and sulphuric acid; also breweries and flour mills. The sale of oil crude and refined is regulated by an exchange.

TIUMEN', a t. of West Siberia, in the government of Tobolsk, stands on the Toura, an affluent of the Ob (q.v.). Its advantageous situation on the highways, both by land and water, which communicate between Russia and Siberia, has made it an important commercial center, and the seat of flourishing manufactures. The vessels which navigate the Ob, the Irtysh, the Tobol, and the Toura, for the most part receive their cargoes here. Large quantities of leather, leather-goods, carpets, soap, candles, and common pottery are manufactured and exported through West Siberia, the Ural countries, the Kirghis steppes, Khokan, Bokhara, and China. Pop. '67, 13,144.

TIVERTON, a municipal and parliamentary borough in the n.e. of Devonshire, 14 m. n. of Exeter. There are important weekly markets, and four great markets for cattle annually. There is a large lace-factory, in which upward of 1000 hands are employed. The town is built on a hill between the rivers Exe and Lowman; hence the old names of the town, TWYFORD and TWOFORDTOWN. The streets in many places are very narrow, but clean. A new town-hall was erected in 1864, and an athenæum has been recently founded. There is a peculiarity about the town in the rapid streams of water flowing down the channels along the sides of the streets. These streams of water were given to the town about the year 1272, by Isabella Rivers, countess of Devon. The castle was built in 1106. The free grammar-school, an old building in the Elizabethan style, was endowed by Mr. Peter Blundell in 1604. In connection with the school there is a scholarship at Balliol college, Oxford, and another at Sydney Sussex college, Cambridge, each of the annual value of not less than £60. There are four exhibitions, of £30 per annum each, for four years, at any college in either university; one exhibition at £50 a year, for seven years, at Balliol college; and one of £25. There are other schools and numerous charities. Tiverton sends two members to the house of commons. Pop. '71, 10,025.

TIVOLI (anc. *Tibur*), a poor t. of central Italy, province of Rome, 18 m.e. from Rome, stands on the slope of Monte Ripoli, one of the Apennines. Tivoli is walled, and has a fortress. The streets are steep, narrow, and beset by beggars. There is a fine cathedral, formerly a temple of Hercules, where Augustus held his tribunal. The surrounding hills are covered with olive trees. The vines of Tivoli are famed for a peculiar sort of grape, in great request for its firmness and luscious flavor, noticed as early as the time of Pliny the Elder. The stone called "travertino," of which great part of Rome is built comes from Tivoli. Pop. 8,000. Near Tivoli is the extensive villa d'Este. Within and without the city there are many monuments of antiquity. In a commanding position above the falls of the Anio rises the temple of Vesta, of a circular form, and in good preservation, built 70 B.C.; there are the extensive remains of the emperor Hadrian's magnificent villa; the villa of Mæcenas; remains of mausoleums, aqueducts, baths, etc. The place is much visited by tourists for its waterfalls, which are lofty, but not very picturesque.

Tibur long existed as a town (according to ancient tradition) before the building of Rome; but the first mention of it in recorded history occurs 446 B.C., during the Roman decemvirate. It was one of the principal towns of the Latin confederation. Its healthy and picturesque situation induced many of the wealthy Romans to choose it for their country residences. Mæcenas, Scipio, Æmilianus, the famous Marius, Metellus Numidicus, and Munatius Plancus, had their Tiburtine villas. Horace preferred Tibur to all other places of resort (although he makes allusion to its moist atmosphere, calling it "Udum Tibur"), and had a country-house in the neighborhood. It is one of the few towns of Latium which will stand on their ancient sites.

TLAXCALA, or **TLASCALA**, a city and state of Mexico, the state being bounded on three sides by Puebla, and w. by Mexico; drained by the Mescala, crossed by the Malinche mountain, and traversed by the Mexico and Vera Cruz railroad, completed in 1872; 1500 sq.m.; pop. '71, 121,665. The city and capital is situated on the Mescala, between two mountains, 20 m. n. of Puebla; pop. '70, 5,000. The surface of the state is mountainous, and the soil fertile, producing large quantities of maize, also the maguey or pulque plant, and in some parts hemp has been successfully cultivated. The Tlaxcalans were a warlike and powerful race, remaining unconquered till 1519, when Cortes defeated them, and they became subject to Spain, not, however, renouncing their religion. They are intelligent and of Indian descent.

TIEMCEN', a t. of Algeria, capital of the province of Oran, and 80 m. s.w. of the city of that name, stands in an undulating country, everywhere irrigated, and brought completely under cultivation. It contains Catholic and Protestant churches, mosques, and synagogues, and there are numerous educational institutions, including schools for Arabs and Jews. It is protected from the s. wind by a range of hills, 4,200 ft. in height. The town is accessible only from the s.w., the other sides presenting steeply escarped fronts. The district around Tiemcen is covered with fruit-trees of all kinds, of which the olive is one of the most valuable, and there is much cultivated land, producing cereals, tobacco, etc. Besides the special markets, a daily market is held, at which cattle, wool, grain, and oils are largely sold. Ostrich feathers and corks are exported; but the trade is for the most part in cloths, hides, grain, and oils. Pop. about 22,000.

TOAD. *Bufo*, a genus of *batrachia*, of the *anourous* or tailless section of the *caducibranchiata*. See **BATRACHIA**. The original genus has been subdivided, and is now constituted into a family, *bufonidae*, to all which the popular name toad is often extended. The form resembles that of the frogs, but is more thick and clumsy, and the hind-legs are generally short, so that the species rather crawl than leap; some of them, indeed, are not known to leap at all. The skin is warty, and the warts or tubercles produce a milky exudation, which in some species is very fetid. Behind the ear there is a porous pad—a very large parotid gland—from which a copious exudation takes place. The muzzle in the restricted genus *bufo* is rounded, but some of the family have an elongated muzzle. The mouth of the true toads is destitute of teeth. The food of toads consists chiefly of small insects and slugs, and they mostly inhabit shady places, avoiding the sunshine, and crawling about either among the stems and leaves of plants or among stones. In their adult state they are much less aquatic than frogs, but their spawn is deposited in water, in which their tadpoles live like those of frogs. They are commonly regarded with disgust, on account of their appearance, the exudation from the skin, and the smell of many of them, yet the eye of the toad is remarkable beautiful. A notion has very generally prevailed that the exudation of the skin is venomous, but it is unsupported by evidence, and toads are handled with perfect impunity. They are eaten by some savage tribes.—Only two species are British. The **COMMON TOAD** (*B. vulgaris*) is abundant in most parts of Britain, and in the western parts of Europe, but is not found in Ireland. A description of it is unnecessary. It spends the winter in a dormant state, and issues from its retreat on the return of spring. Its spawn is deposited in March or April, and much resembles that of the frog, but the ova are smaller and more numerous. The young toad is very small when it loses its tail and gills, and exchanges the tadpole for the adult form. Toads are very useful in gardens, in preventing the excessive increase of some kinds of insects; and on this account it is a frequent practice to put them into hot-bed frames, for which use the market gardeners of the neighborhood of London often purchase them at the price of fourpence each. They have occasionally been tamed, and display some intelligence, readily recognizing those who feed them and are kind to them. A tame toad, of which an account is given by Pennant in his *British Zoology*, lived for more than 40 years, and was at last killed by a raven.

Numerous instances are on record in which toads are said to have been found embedded in rocks, walls, and even in the trunks of trees, where the necessary conclusion is that they must have lived a very long time, in a dormant state. Unfortunately, however, the discovery of these toads has almost always been made by unscientific persons, and there is a want of proper and trustworthy observations as to the places in which they have been found. Attempts have been made by several naturalists, and among others by the late Dr. Buckland, to throw light on the subject by experiment, immuring toads in various ways, and the result, although showing that when air is not wholly excluded they are capable of living for a long time in their imprisonment, probably in a dormant state, is not favorable to the belief that such existence could extend over many years. An interesting account of Dr. Buckland's experiments will be found in Mr. F. Buckland's *Curiosities of Natural History*.

The other British species of toad is the **NATTERJACK** (*B. calamita*) which was first described as British by Pennant, and has since been found to be pretty abundant in some parts of England, and in the s.w. of Ireland, chiefly in the vicinity of the sea. It much resembles the common toad, but is of a yellowish-brown color, clouded with dull olive, a bright yellow line passing along the middle of the back. It has a disgusting smell. It never hops, and its motion is more like walking or running than the crawling of the common toad.—Several other species of toad are found in Europe. Some of those found in tropical countries attain a very large size, and exhibit protuberances of various kinds, far exceeding even in proportion the warty excrescences of the common toad.

TOAD-FISH. See **FROG-FISH**, *ante*.

TOADFLAX. *Linaria*, a genus of plants of the natural order *scrophularineæ*, very closely allied to **SNAPDRAGON** (q.v.), from which genus this has but recently been separated, and is distinguished chiefly by the spur at the base of the corolla, and the capsule opening by valves or teeth, not by pores.—The species are herbaceous plants, natives chiefly of the colder and temperate parts of the old world. Some of them are

natives of Britain, of which the most common is *L. vulgaris*, a species with erect stem 1 to 3 ft. high, glaucous, linear-lanceolate leaves which thickly cover the stem, and terminal spikes of yellow flowers. It grows in hedges, the borders of cornfields, etc. It possesses purgative and diuretic properties, and a decoction of it is used as a fly-poison; but it is regarded as a troublesome weed by farmers. It has found its way, probably along with grain or other grass seeds, into the United States. A very remarkable monstrosity is sometimes seen in this plant, to which the name *peloria* has been given, the flower presenting five spurs, and five usually imperfect stamens.—*L. cymbalaria*, a pretty little plant with trailing stems and five-lobed cordate leaves, is often planted to cover old walls, etc., and is either a native of Britain, or naturalized in many places.

TOADSTONE, a local Derbyshire name for a soft and earthy variety of trap, looking like an argillaceous deposit.

TOAST (Lat. *tostus*, scorched or roasted) is the name given to bread dried or scorched before the fire. So early as the 16th c. toasted bread formed a favorite addition to English drinks. Sack was drunk with toast, and so was punch. The practice of drinking healths, particularly that of an entertainer, is one so natural, so likely to spring up spontaneously, that it is impossible to say when it began. Certain it is, however, that it received an artificial development owing to the prevalence of convivial habits in the 17th century. Then it became the fashion to drink not to the health of entertainers only, but to that of each guest, of absent friends, and more especially of the unmarried woman whose attractions were most generally acknowledged. It also became the custom to describe a woman whose health was so drunk as herself "a toast." In this sense, the application of the word is said to have had its origin in an incident which occurred at Bath, and which is recorded in the 24th number of the *Rambler*, in the following passage: "It happened that on a public day, a celebrated beauty of these times" (when it was the fashion for ladies to bathe publicly in elegant dresses made for the purpose) "was in the Cross Bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow, half fuddled, who offered to jump in, and swore, though he liked not the liquor, he would have the toast" (making, of course, allusion to the custom of putting toast in punch). "He was opposed in his resolution; yet this whim gave foundation to the present honor which is done to the lady we mention in our liquor, who has ever since been called a toast." Whatever may be the origin of the use of the word "toast" in this sense, we now apply it not only to any person, but to any sentiment mentioned with honor before drinking. The French have adopted the word "toast" from us; making it masculine when applied to a man or a sentiment, but feminine when applied to a woman.—See Chambers's *Book of Days*.

TOBACCO (of uncertain derivation, but most probably from the native American name), a genus (*nicotiana*) of plants of the natural order *solanaceæ*, having large broad leaves; a five-parted calyx; a funnel-shaped, five-lobed corolla, and five stamens; the flowers growing in panicles at the top of the stem; the fruit a two celled, five-valved, many-seeded capsule. The species are mostly herbaceous plants, rarely shrubby, with large broad leaves, and everywhere covered with clammy hairs. They are natives of warm countries, most of them American, although some are found in the East Indies. They all possess the narcotic property, on account of which a few of them are extensively cultivated. It resides in almost all parts of the plant, although the leaves are almost exclusively used. The most important species is the COMMON TOBACCO, or VIRGINIAN TOBACCO (*N. tabacum*), a native of the warm parts of America, the cultivation of which had extended, before the discovery of the new world by Columbus, far to the n. of the regions in which the plant appears to be indigenous. It is about 5 or 6 ft. high, erect, with lanceolate, sessile leaves, 6 to 18 in. long, and rose-colored flowers, the throat of the corolla inflated, the segments pointed. There are numerous varieties, differing more or less in the size and form of the leaves, and in the form and color of the flowers, some of which are regarded by some botanists as distinct species. One of these is the BROAD-LEAVED TOBACCO, or MARYLAND TOBACCO, which has a thicker stem, and much broader leaves. The GREEN TOBACCO (*N. rustica*), sometimes called ENGLISH TOBACCO, because it was the first kind introduced into England for cultivation, is a smaller plant, from 3 to 5 ft. high, with ovate, stalked leaves, and the segments of the corolla rounded, its tube cylindrical. It is a native of the east, but is more hardy than the Virginian tobacco, and is therefore cultivated in more northern regions. The PERSIAN TOBACCO (*N. Persica*) has the root-leaves oblong, those of the stem lanceolate and sessile; the corolla salver-shaped, with a long tube; its lobes rather unequal. It is a native of Persia, and furnishes the Shiraz tobacco, so much esteemed in the east, and which is milder than the common tobacco. Other species of tobacco are used in different parts of America, and some of them are cultivated to a small extent, as *N. repanda*, in Cuba; *N. quadrivalvis*, by the Indians on the Missouri; *N. multivalvis* by the Indians on the Columbia; and *N. nana*, by the Indians of the Rocky mountains.

It is somewhat doubtful whether the use of tobacco as a narcotic was known in the east before the discovery of America. Meyen, in his *Geography of Plants*, expresses the opinion that the smoking of tobacco is of great antiquity among the Chinese, because on very old sculptures he has "observed the very same tobacco-pipes which are now in

use." Meyen's authority, however, is greater as a botanist than as an archæologist, and cannot be received as decisive of the antiquity of the sculptures of which he speaks. It is not improbable that the smoking of tobacco has been long practiced in China, but it is not certain. If it was so, the custom did not extend among neighboring nations, which, however, has been the case also as to the use of some other narcotics; whereas, on the introduction of the use of tobacco from America, it rapidly extended throughout Europe, and soon became extremely prevalent among oriental nations. In the present state of our knowledge, no ethnological argument can be founded upon the prevalence of smoking among the Mongolians and the American Indians. The smoking of tobacco was found by Columbus to be practiced in the West Indies, where the natives made it into cylindrical rolls, wrapped in maize-leaf. It has been prevalent from unknown antiquity among the American Indians as far north as Canada. With them it even has a religious character, and is connected with their worship and with all their important transactions. Thus the calumet (q.v.), or pipe of peace, is indispensable to the ratification of a treaty; and smoking together has even greater significance of friendship than eating together has among other nations. "In the belief of the ancient worshippers, the Great Spirit smelled a sweet savor as the smoke of the sacred plant ascended to the heavens; and the homely implement of modern luxury was in their hands a sacred censer, from which the hallowed vapor rose with as fitting propitiatory odors as that which perfumes the awful precincts of the cathedral altar, amid the mysteries of the church's high and holy days."—Wilson's *Prehistoric Man*, i. 383. The seeds of the tobacco plant were first brought to Europe by Gonzalo Hernandez de Oviedo, who introduced it into Spain, where it was first cultivated as an ornamental plant, till Nicolo Manardes extolled it as possessed of medicinal virtues. It was introduced into Italy in 1560. The use of tobacco in the form of snuff soon followed its introduction for smoking. There is no reference to the use of tobacco in Shakespeare, yet it is certain from other evidence that it was well known in England in his time, although at first its use was confined to the wealthy, as the price was very high and it was smoked in very small pipes—probably the same which are known to antiquaries as *elfin pipes*—and the smoke was expelled, not from the mouth, but by the nostrils, in which way the narcotic power of the herb is much greater. Tobacco was at first recommended for medicinal virtues, which were greatly exaggerated, but soon became an article of luxury. The popes Urban VIII. and Innocent XI. fulminated against it the thunders of the church; the priests and sultans of Turkey declared smoking a crime, sultan Amuret IV. decreeing its punishment by the most cruel kinds of death; the pipes of smokers were thrust through their noses in Turkey; and in Russia the noses of smokers were cut off in the earlier part of the 17th century. King James I. of England issued a *Counterblast to Tobacco*, in which he described its use as "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black, stinking fumes thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless." All opposition, however, was in vain. The use of tobacco increased and has continued to increase to the present day, when it is more prevalent than at any former time, the luxury of rich and poor, of civilized nations and of savage tribes. Although it did not become prevalent in the east till the 17th c. the Turks and Persians are now the greatest smokers in the world. In India, all classes and both sexes smoke; in China, the practice—perhaps there more ancient—is universal, and girls, from the age of eight or nine, wear, as an appendage to their dress, a small silken pocket to hold tobacco and a pipe. How the practice of smoking has increased in Britain, every one knows. The use of snuff has not increased in the same manner, but has rather diminished. Tobacco is used in the three modes of smoking, chewing, and snuffing. Plugging, the stuffing of the nostrils with quids of tobacco, has been almost universally discontinued, although at one time it was practiced to a small extent. In Britain, chewing is now chiefly practiced by sailors, smoking being prohibited or restricted at sea, on account of the danger of fire; but it is very prevalent in some parts of the world, particularly in North America. The smoking of tobacco is everywhere more or less social, like the use of wine; and the snuff-box is handed from one to another in token of good-fellowship.

Tobacco derives its botanical name (*Nicotiana*) from Jean Nicot, who introduced it into France. In that country, its use in the form of snuff began in the reign of Francis II. About the same time, a snuff-manufactory was established at Seville, which produced the celebrated Spanish snuff. The tobacco plant was soon after introduced into other countries of Europe. In 1657, the manufacture and sale of tobacco were farmed out in Venice, and began to yield a considerable revenue. Much revenue has since been derived from the same source, in many countries. Tobacco is now extensively cultivated in many parts of Europe, as well as in Asia and America. Prohibitory laws alone prevent its cultivation in the southern parts of Britain and Ireland, of which the climate is quite suitable to it. The quality of the leaf, however, deteriorates in the more northern regions in which it is cultivated, as in Germany, when it is continuously raised from home-grown seed, and seed is therefore imported from warmer countries.

Cultivation and Commerce.—The cultivation of tobacco requires a rich, loose soil, and the strongest manures are advantageous. The influence of soil, climate, and manures on the quality of the produce is very great, almost beyond what is known in any other cultivated plant. Vegetable manures are best for tobacco intended for smoking; animal

manures are preferred for that which is to be made into snuff. In the more northern regions in which tobacco is cultivated, the seed is sown in a hot-bed, protected from frost by mats, and the plants are planted out in rows from two feet to three feet apart in the field. The ground is frequently hoed and stirred. Where the plants are not intended for seed, the top is usually broken off, so as to prevent flowering, that its whole strength may be directed to the leaves. In America, when the leaves begin to become yellow, or are marked with yellow blotches, the plants are cut down, and hung up in a large barn to dry, but in Germany, the leaves are gathered as they become yellow, are tied in small bunches, and are hung up in a shady place to dry.

The cultivation of tobacco is comparatively easy, and, although a warm climate suits it best, it is without much difficulty raised in most parts of Europe. The usual plan in the great tobacco-producing countries is to sow the seed in seed-beds of rich soil, and, as the seed is extremely minute, it is first mixed largely with sand or wood-ashes, to assist in spreading it thinly. In Virginia, which may be taken as one of the best tobacco-growing districts, this is usually done in the first week in January. After the seed-beds have been carefully prepared and sown, small branches of trees are laid over, to protect the seed, when it germinates, from the effects of frost; but these are removed as soon as can be done with safety, and the plants then grow rapidly, and are ready for transplanting into the fields about the beginning of June. The land in the fields is very carefully prepared, and small hillocks are raised up in rows; each is about a foot in diameter, and flattened at the top. With the first appearance of rain, the plants are carefully raised from the seed-beds, and carried usually by children, who deposit one on each hillock, on which it is carefully planted by experienced men, who follow after the children. Only wet weather will do for planting, so that this operation often lasts until the end of July. When planted, the tobacco crop requires much careful attention to weeding, and a watchful eye to prevent the ravages of various insect enemies. Much of this latter work is done by flocks of turkeys, kept on purpose by the planters. As soon as the plants begin to throw up the flower-shoot it is nipped off; otherwise it would weaken the leaves; but this process is neglected in some countries, especially in Turkey and Greece, where small leaves are preferred, and where, in some cases, as in the celebrated Latakia tobacco, both leaves, buds, and flowers are used. The time generally chosen for cutting it is mid-day, or when the sun is powerful, and the morning and evening dews absent. The cutting is done by hand, and only such plants are chosen as are ready, which is known by a clammy exudation which forms over the leaf, often giving it a spotted appearance. If the plants are very large, the stalk is often split down, to facilitate the drying. They are then removed from the field to the tobacco-house, around which are erected light scaffolds, to which the plants are suspended, generally by passing a thin stick through a split in the stalk of each, and so placing a number of plants on each stick, just near enough to prevent them touching each other. After some time hanging in the open air, the plants on the sticks are removed, and suspended in a similar way inside the curing-house, until the drying is completed. The leaves are next removed from the stalks, and all bad ones rejected. The chosen ones are tied up in bundles called hands, and these are packed in hogsheads, enormous pressure being applied in the packing. These hogsheads are very large casks, which must not contain less than 950 lbs. net in the United States, where the government exercises a very strict surveillance over the weight and quality of all tobacco grown and cured there. Previously to the late disastrous war with Brazil, a large tobacco-export had been carried on by Paraguay. The quality, though not equal to that grown in the United States, was, however, fair, and had been improving. Turkey has also, for several years past, been steadily increasing her exports of tobacco to Great Britain. The quality of Turkish tobacco is very peculiar: it is small in the leaf, and of a light color—either a bright yellow, a yellowish green, or a yellowish brown. Being extremely mild, it is a favorite with many smokers.

Tobacco, owing to the high rate of duty when in any manufactured form, is mostly imported in the leaf; but small quantities are brought in, chiefly for re-export, in various states of manufacture. The chief of these is called cavendish, which is made by stripping the blades of the leaves from the midribs, and, after sprinkling them with an infusion of tobacco made from the stalks and other waste parts, laying them in heaps to heat or ferment. This darkens their color; and while still moist and flaccid, they are laid smoothly upon each other, so as to form cakes about 9 in. in length by 3 in breadth, which are pressed by powerful machinery until they are very compact and hard. Another kind is called negrohead, which is formed into sticks about an inch thick, and 8 or 9 in length, which are laid across each other equally, and are then pressed into cakes. When the sticks are pulled apart, the rounded depressions caused by pressing them into one another gives them a slight resemblance to the wavy locks of a negro's hair, whence they receive their name. The leaf simply twisted into a rope, as in the kind called varinas roll and other similar sorts, as well as that which is merely cut small for smoking, is all held to be "manufactured," and charged with the highest duty, so that very little indeed is imported.

Cigars and *cheroots* are also forms of manufactured tobacco; but so much in favor are these with smokers, that the exorbitant duty is very little check upon their importation. The island of Cuba supplies not only the best but also the largest quantity; the Havana tobacco being exceedingly well cultivated and cared for, and being especially

well adapted for cigar-making. More than half of all the cigars imported into Great Britain are from Cuba; and the cheroots are chiefly from Manilla. The Philippine islands also send us about 100,000 lbs. per annum of cigars, and other countries about 200,000 lbs. The total amount sent to Great Britain annually is a little over 600,000 lbs., equal in value to about £350,000. Cigars and cheroots are essentially the same; they only differ in form.

The tobacco received in the leaf is all more or less manufactured in this country. It is either cut finely, so as to be convenient for use in pipes, or made into cavendish, negro-head, or twist; the last is often called *pig-tail*; and is a continuous string of tobacco about the thickness of a quill, many yards in length, made by twisting and spinning the leaves when flaccid from being wetted and heated as before described; this string is then made up into balls, and is the kind chiefly used by those who chew tobacco.

Snuff is another form of manufactured tobacco largely made in Great Britain. It is formed by grinding the leaf either with or without the leaf-stalks and midribs. The grinding is generally effected in wooden mortars, with pestles also of wood; and some kinds of snuff are prepared from kiln-dried tobacco, while others are made from the soft leaves. The varieties are numerous, and fortunes have been made by manufacturers who have been fortunate enough to make a snuff which has become a favorite.

Tobacco is subject to a higher rate of duty, in proportion to its intrinsic value, than any other article. The value of the best sorts in the leaf only ranges from 3d. to 9d. per pound; while the duty is as follows: Unmanufactured, containing 10 per cent or more of natural moisture, 3s. 6d. per pound; and if containing less than 10 per cent of moisture, 3s. 10d. per pound. The various kinds of manufactured tobacco range from 4s. 4d. to 5s. 4d. per pound. In consequence of this disproportion between the value of the material and the duty paid upon it, its importation is fettered with numerous conditions, which should be well understood by those who import either for trade or for private use. The chief regulations are as follow: It is prohibited to be imported at any other ports in the United Kingdom than Aberdeen, Belfast, Cork, Cowes, Drogheda, Dublin, Falmouth, Fleetwood, Galway, Glasgow, Greenock, Hartlepool, Hull, Lancaster, Leith, Limerick, Liverpool, London, Londonderry, Newcastle, Newry, Plymouth, Port Glasgow, Portsmouth, Preston, Sligo, Southampton, Swansea, Waterford, Wexford, and Whitelaven; or in original packages of less than 80 pounds weight. This does not apply to the small quantities which passengers may wish to bring with them in their baggage; in which case, they may pay duty on any quantity of manufactured tobacco or cigars under 3 pounds, if from the continent (except in the case of frequent visitors), and any quantity not exceeding 7 pounds if from the East and West Indies, and other distant voyages; and of unmanufactured tobacco, passengers may pay duty, and import as surplus stores any quantity not exceeding 9 pounds. Of cigars unconsumed on the passage, the passenger is only allowed 8 ounces free of duty. The penalties for any invasion of these regulations are very heavy, in addition to which the goods are always forfeited to the crown.

The quantity of manufactured tobacco, that is, cigars and snuff, which was imported into the United Kingdom in 1876 was 3,768,908 lbs., and its value £1,276,852; of unmanufactured, 76,064,627 lbs., and its value £2,669,370. The gross amount of revenue collected by the custom-house, for tobacco and snuff, in 1876-77, after deducting repayments and drawbacks, was £7,775,375. The revenue from this article has upon the whole kept steadily increasing for a considerable number of years. It had prior to that been greatly affected by the civil war in America. The smallest value of manufactured tobacco between 1857 and 1876 was imported in 1859; of unmanufactured, during the same period, the smallest value was imported the following year—thus plainly indicating the influence of that struggle.

Tobacco is used as a sedative or narcotic over a larger area, and among a greater number of people than any similar substance, opium being the next to it in these respects, and the hemp-plant the third. Tobacco leaves, when submitted to chemical analysis, yield nicotine (q.v.), which is its most characteristic constituent, albumen, a gluten-like substance, gum, resin, malic and citric acids, and a large amount of inorganic constituents, 100 parts of the dry leaf yielding from about 19 to 27 per cent of ash, in which potash, lime, and silica preponderate. In a physiological and medical point of view, the analysis of the smoke of tobacco is of far more importance than that of the leaf. From the researches of Dr. Richardson, it appears that although "the widest differences prevail in respect to the products arising from differing cigars, differing kinds of tobacco, and differing pipes," there are certain substances which are common to all varieties of tobacco-smoke. Firstly, there is in all tobacco-smoke a certain amount of *watery vapor*, impregnated with various substances, from which it may be separated. Secondly, a small quantity of free carbon is always present; it is to the presence of this constituent that the blue color of the smoke is due. "It is this carbon," says Dr. Richardson, "which in confirmed and inveterate smokers settles on the back part of the throat and on the living membrane of the bronchial tubes, creating often a copious secretion, which it discolors, and which is coughed up of a dark coal-like appearance."—*For and Against Tobacco*, Lond. 1865, p. 5. Thirdly, there is a certain quantity of ammonia present. The presence of the ammonia gives to the smoke an alkaline reaction. Moreover, "it is the ammonia that bites the tongue after long smoking; it is the ammonia that makes the

tongue and throat of the smoker so dry, and induces him to quaff as he smokes, and that partly excites the salivary glands to secrete so freely. The ammonia also exerts an influence on the blood."—Richardson, *op. cit.*, p. 6. Fourthly, *carbonic acid* is always present, as may be shown by its action on lime-water. The amount differs extremely in the smoke from different kinds of tobacco, but, according to Dr. Richardson, it may be fairly inferred that the sleepiness, headache, and lassitude which follow the prolonged inhalation of tobacco-fumes, are largely due to this agent. Fifthly, tobacco-smoke yields a *product having an oily appearance*, and possessing poisonous properties. It is popularly known as *oil of tobacco*; and on further analysis, it is found to contain three substances—viz., a fluid alkaloid, *nicotine*; a *volatile substance* having an empyreumatic odor; and an *extract* of a dark resinous character, having a bitter taste. The symptoms of tremor, palpitation, and paralysis which ensue after excessive smoking, especially in persons unaccustomed to indulgence in this practice, seem to depend upon the nicotine, which is known, by experiment, to be highly poisonous. "The peculiar smell of stale tobacco-smoke, which hangs so long on the breath of the smoker, and on articles of clothing, is derived from the volatile empyreumatic substance; and the exceedingly nauseous sharp taste which is recognized by every unpracticed smoker, when he takes a foul pipe into his mouth, is due to the bitter extract. It is apparently this extract which creates vomiting in persons unaccustomed to tobacco, and of which the body after a time becomes tolerant."—Richardson, *op. cit.*, p. 8. Hence it appears that the more common effects are due to the carbonic acid and the ammonia; while the rarer and more severe are due to the nicotine, the empyreumatic substance, and the resin.

It is unnecessary to enter into details regarding the symptoms of slight tobacco-poisoning, because they are well known to the great majority of the male population. Fortunately, the effects produced by tobacco are very transitory, as the poison finds a ready exit from the body. The system, after being subjected for a few times to the poisons of tobacco-smoke, becomes accustomed to their influence, the distressing symptoms no longer occur, and a condition of "tolerance" is established. From the extensive investigations of Dr. Richardson, it appears that there are no grounds for believing that smoking can produce any organic changes. It may, however, produce various functional disturbances: (a) On the stomach. (b) On the heart, producing debility and irregular action. (c) On the organs of the senses, as dilatation of the pupil, confusion of vision, subjective sounds, etc. (d) On the brain, suspending the waste of that organ, and oppressing it if it be duly nourished, but soothing it if it be exhausted. (e) On the nerves leading to over-secretion of the glands which they control. (f) On the mucous membrane of the mouth, causing what has been described as the "smoker's sore throat." "The disease consists of an irritable state of the mucous membrane at the back of the throat, redness there, dryness, a tendency to cough, and an enlarged soft, sore condition of the tonsils, rendering every act of swallowing painful and difficult." It may exist without detection for a long time; but if a damp, cold, foggy state of the air comes on, the throat becomes troublesome and painful, enlargement of the tonsils is detected, and the symptoms become much aggravated by any attempt to smoke. This condition is more readily induced by the use of cigars than of pipes; it is quite incurable so long as the patient continues to smoke, but soon disappears when the use of tobacco is entirely suspended. In association with this condition of the throat, the gums are usually abnormally pale and firm. (g) On the bronchial surface of the lungs, sustaining any irritation that may be present, and increasing the cough. There is no evidence that tobacco-smoke can cause specific diseases, such as insanity, epilepsy, St. Vitus's dance, apoplexy, organic disease of the heart, cancer, consumption, or chronic bronchitis. If, as is universally allowed, tobacco possesses, like alcohol, arsenic (in minute doses), opium, tea, coffee, etc., the power of arresting the oxidation of the living tissues, and thus checking their disintegration, it follows (1) that the habit of smoking must be "most deleterious to the young, causing in them impairment of growth, premature manhood, and physical degradation" (Richardson, *op. cit.*, p. 73); and (2) that the habit may be conducive to the physical well-being of the individual, provided he cannot supply himself with sufficient nourishing food to supply the daily tear and wear of the muscular and nervous systems.

For a long controversy on the question, *Is Smoking Injurious to Health?* in which sir Ranald Martin, Mr. Solly, Dr. Ranking, and other medical men took a part, the reader is referred to the 1st volume of *The Lancet* for 1857. The whole matter is very fairly summed up by Dr. Richardson in the excellent pamphlet from which we have so freely borrowed in this article—a memoir which we can cordially recommend to all who take an interest in this subject. Before the full maturity of the system is attained, even the smallest amount of smoking is hurtful; subsequently, the habit is, in most instances, only prejudicial when it is carried to excess. We cannot honestly say more against tobacco than can be urged against any other luxury, and of nearly every luxury it is the least injurious. "It is innocuous as compared with alcohol; it does infinitely less harm than opium; it is in no sense worse than tea; and by the side of high living altogether, it contrasts most favorably."—Richardson, *op. cit.*, p. 75. In conclusion, a word or two may be said regarding the kind of pipe that should be used. A long, perfectly clean pipe, composed of an absorbing material like clay or meerschaum, which can suck up the oily matter before it reaches the mouth, is always to be preferred; and M. Melsens,

to whom the scientific world is indebted for many ingenious applications of chemistry to hygiene and the treatment of diseases, has recently suggested, that if a plug of cotton, saturated with a strong solution of citric or tannic acid, were placed in the stem, so as to filter the smoke before it reached the mouth, all the nicotine would be seized by and combine with the acid. The different kinds of tobacco exert a different influence on the smoker according to the amount of noxious ingredients which they contain. Thus, cavendish, pigtail, and coarse shag yield the oily matters in much more abundance than Latakia or Turkish, which are hence termed mild tobaccos. Cigars produce dyspepsia much more rapidly than pipes, for in smoking them, unless with a long month-piece, nicotine is necessarily absorbed.

Snuffing is probably the least injurious form in which to take tobacco, and chewing the most deleterious; yet sailors, who chew more freely than any other class in this country, are usually men in vigorous health, and after prolonged practice the quantity they can consume is enormous. Dr. Arrott mentions the case of a harbor superintendent, formerly a sailor, aged 64, in the almost uninterrupted enjoyment of good health, who chewed tobacco for upward of 50 years, and at length ate it, swallowing every particle of leaf and juice. For many years, he had been in the constant practice of "eating a quarter of a pound of the strongest negrohead every five days."—*The Lancet*, 1847, vol. i. p. 440.

The effects which tobacco produces in large doses, when taken by persons unaccustomed to its use, in the form of powder, infusion, or excessive smoking, are "faintness, nausea, vomiting, giddiness, delirium, loss of power of the limbs, general relaxation of the muscular system, trembling, complete prostration of strength, coldness of the surface, with cold, clammy perspiration, convulsive movements, paralysis, and death. In some cases, there is purging, with violent pain in the abdomen; in others, there is rather a sense of sinking or depression in the region of the heart, creating a sense of impending dissolution. With the above-mentioned symptoms, there is a dilatation of the pupils, dimness of the sight, a small, weak, and scarcely perceptible pulse, and difficulty of breathing."—Taylor's *Principles and Practice of Medical Jurisprudence*, p. 321. Although there are two recorded cases of poisoning by nicotine, poisoning by tobacco has rarely given rise to medico-legal investigation. There is, however, reason to believe that porter is often drugged with tobacco or Scotch snuff, for the purpose of stupefying persons with a view to robbery. In all cases of poisoning with tobacco, if it has been swallowed, an emetic of a scruple of sulphate of zinc should be at once administered, and the most powerful stimulants, both external and internal, should be employed. Prof. Haughton has shown that nicotine and strychnine antagonize one another; on this assumption, strychnine, carefully administered, would be the proper antidote.

Tobacco has been used in medicine in the form of an enema, with the view of relaxing the muscular fibers, in cases of strangulated hernia, stricture of the bowel or urethra, tetanus, etc.; but in such cases, it has now been generally superseded by chloroform. If it continue to hold a place in the pharmacopœia, it will probably be as an antidote to strychnine.

It must be recollected that *Indian tobacco* has nothing in common with the subject of this article, and is a synonym for *lobelia inflata*.

TOBACCO (*ante*). The culture of tobacco began in Virginia with the first settlement of the colony. It is recorded that in 1615 the gardens, fields, and even the streets of Jamestown were planted with tobacco; which immediately became, not only the staple crop, but the principal currency of the colony. In 1619 "ninety agreeable persons, young and incorrupt," and in 1621, "sixty more maids, of virtuous education, young and handsome," were sent out from London on a marriage speculation. The first lot of these ladies was bought by the colonists for 120 pounds of tobacco each; the second lot brought 150 pounds each. By the year 1622 the annual product of tobacco amounted to 60,000 pounds, and it more than doubled during the next 20 years. The culture of this plant was introduced into the Dutch colony of New York in 1646, though it never gained the same prominence there as further south. But Maryland, the Carolinas, Georgia, and later Kentucky, made it the leading object of their culture almost from their first settlement. It long constituted the most valuable export of British America; but the product per acre had been diminishing for many years before the revolution, owing to the difficulty of supplying manure, and the consequent exhaustion of the soil. From 1744 to 1776 the exports of this crop averaged 40,000,000 pounds a year. Tobacco has now become a somewhat prominent crop in Massachusetts and Connecticut, and in both of these states its culture has rapidly extended. In 1850 but 138,246 pounds were raised in Massachusetts; in 1860 the crop increased to 3,233,198 pounds, and in 1870 to 7,312,885. Since the latter date it has fallen off, and in 1878 was 4,320,000; and 1879, 4,350,000 pounds. The aggregate yield of the country in 1840 was reported by the census of that year as 219,163,319 pounds; in 1850 it was reduced to 199,752,655 pounds; but in 1860 it went up to 434,209,461 pounds, to fall again in 1870 to 262,735,021 pounds, a fluctuation to be explained in part by the many casualties to which it is liable, damage by insects, hail, drought, frosts, etc. Though it is produced in all the states, there were only 14 states in 1870 that produced, each, as much as 1,000,000 pounds, while several counties in tobacco states yield each two, three, or five

millions of pounds. Kentucky and Virginia were credited with more than half the crop, the former state alone 40 per cent of it. Only seven states separately exceeded 10,000,000 pounds, by the census of 1870; Kentucky, Virginia, Tennessee, Ohio, Maryland, Missouri, and North Carolina, in order of precedence. Connecticut grows some tobacco in every county, though Hartford co. was credited in 1870 with 5,830,209 pounds of the 8,328,798 pounds reported. Three Atlantic states, with four western, at one time monopolized the production, as may be seen by the following table:

STATES.	1850.	1860.	1870.	1874.
Virginia	56,803,227	123,967,757	37,086,364	35,000,000
Kentucky.....	55,501,196	108,102,433	105,305,869	34,500,000
Tennessee.....	20,148,932	38,031,277	21,465,452	5,780,000
Maryland.....	21,407,497	38,410,965	15,785,339	16,500,000
North Carolina.....	11,984,786	32,853,350	11,150,087	8,500,000
Ohio	10,454,449	25,528,972	18,741,973	13,000,000
Missouri.....	17,113,784	25,086,196	12,320,483	13,800,000
Total.....	193,413,871	392,880,850	221,858,567	127,140,000
Other states.....	6,338,784	41,328,611	40,879,774	51,315,000
Grand total.....	199,752,655	434,209,461	262,738,341	178,355,000

None of the cotton states produce much tobacco, but one county in Florida, Gadsden, has long been celebrated for the production of Cuba tobacco, which always brings a high price. In 1870 there were 211 counties in the United States producing more than 100,000 pounds each, while all others contributed little more than 5 per cent of the crop. The number of acres planted in tobacco in all the states was, in 1874, 143,277, divided as follows: New Hampshire, 130; Massachusetts, 385; Connecticut, 6,475; New York, 1215; Pennsylvania, 8,427; Maryland, 15,553; Virginia, 35,180; North Carolina, 12,737; Florida, 309; Tennessee, 2,402; West Virginia, 600; Kentucky, 30,025; Ohio, 10,638; Indiana, 8,225; Illinois, 1382; Wisconsin, 760; Missouri, 13,843. The general average price per pound in 1874 was 11.1 cents. There are a great many varieties of American tobacco, the exhibit in the economic museum of agriculture in connection with the department at Washington showing in 1877 90 specimens from 21 states, the best sample being a Virginia tobacco, said to have brought \$4 per pound. Included in the exhibit was a specimen of wild Indian tobacco from Arizona. The Connecticut seed-leaf is cultivated almost exclusively in New England, and in certain counties in New York. A cross from Havana seed is grown in Bucks co., Penn., much resembling imported Cuba tobacco. The Maryland tobacco is of two varieties, the broad leaf and the narrow leaf. The former commands a higher price; the latter yields a larger quantity. Much of it is exported, a large order being usually filled for the French government. There are in Maryland the bay tobacco, big Pryor variety, white stem, Frederick, etc. North Carolina produces the Gooch, white stem, yellow Pryor, big Orinoco, and little Orinoco; Tennessee has some of these, and also the big and little Frederick, blue Pryor, big stem, etc. Much of the Kentucky tobacco goes to Germany, Austria, and the north of Europe; certain varieties are sent to Mexico and to the coast of Africa. The white Burley, long green, Baltimore Cuba, twist bud, and big shoe-string, are among the Kentucky varieties. Rotation is commonly practiced with this crop. Thus, in the Connecticut valley it is customary to take from one to three crops of tobacco, then a hay or grain crop, followed by grass for several years. In the Onondaga district, N. Y., the order is clover, wheat, tobacco; Steuben co., clover, corn, tobacco; in Lancaster co., Penn., which produces a large proportion of the crop of that state, tobacco is preceded by corn and followed by wheat; in Virginia the custom frequently is to take off two or three crops of tobacco, followed by wheat, afterward clover or grass.—Up to 1877, tobacco had paid to the general government a revenue of more than \$426,000,000 in 16 years; meanwhile, it is a remarkable fact that the return to the government had been greater than that to the producers: the excess in 1877 reaching \$12,500,000. The following table shows the production, area, and value of the tobacco crop of the United States, 1868–79:

YEAR.	Product.	Area.	Value.	Value per lb.	Yield p'r acre	Value p'r acre
1868.....	402,000,000	536,000	\$42,612,000	10.6	750	\$79.50
1869.....	233,000,000	604,000	41,265,000	10.5	651	68.32
1870.....	385,000,000	575,000	38,500,000	10.	669	66.90
1871.....	426,000,000	580,000	41,748,000	9.8	734	71.96
1872.....	480,000,000	584,600	49,920,000	10.4	821	85.89
1873.....	506,000,000	653,000	41,998,000	8.3	775	64.32
1874.....	315,000,000	500,000	34,650,000	11.	630	69.30
1875.....	522,000,000	710,000	41,760,000	8.	735	58.81
1876.....	535,000,000	733,000	39,590,000	7.4	720	54.01
1877.....	580,000,000	745,000	40,600,000	7.	778	54.49
1878.....	429,200,000	580,000	25,752,000	6.	740	44.40
1879.....	391,278,350	392,100	22,727,524	5.7	997	56.82

The following table shows the production of tobacco in the United States in 1879, by states:

STATES.	Quantity Produced.	Av. yield per acre.	Acreage.	Value per lb.	Total Value.
Massachusetts.....	4,350,000	1,500	2,900	11	\$478,500
Connecticut.....	9,660,000	1,400	6,900	12	1,159,200
New York.....	2,432,750	1,315	1,850	12	291,930
Pennsylvania.....	29,617,700	1,459	20,300	09	2,665,593
Maryland.....	25,826,400	633	40,800	05	2,291,320
Virginia.....	86,524,300	763	113,400	05	4,326,210
North Carolina.....	11,898,400	556	21,400	07	832,888
Tennessee.....	44,100,000	800	55,200	05	2,208,000
West Virginia.....	1,875,300	658	2,850	06	112,518
Kentucky.....	136,880,000	793	160,000	05	6,314,000
Ohio.....	14,091,000	671	21,000	06	856,460
Indiana.....	6,036,000	840	7,900	05	331,800
Illinois.....	4,550,000	650	7,000	06	273,000
Wisconsin.....	5,474,900	1,033	5,300	12	656,988
Missouri.....	15,050,100	663	22,700	05	752,505
Nevada, Colorado, and territories.....	2,251,600	866	2,600	07	157,612
Total.....	391,278,350	907	392,100	06	\$52,727,524

TOBACCO-PIPES, are made of various materials, the commonest in Europe being a fine white clay, which has consequently received the name of *pipe-clay*. Their usual form is too well known to need description, but the manufacture of a clay tobacco-pipe is by no means a simple affair. The first part of the operation is performed by trained children, who, with nice skill, roll out upon a board a small piece of clay into a long slender cylindrical rod, at the end of which is then attached a lump of clay, just enough to form the bowl. These rudimentary pipes are arranged by dozens on a board, until they have become sufficiently hardened. They are then handed to the pipe-maker, who takes a pointed iron wire, and first dipping it into oil, pushes it into the end of the thin column of clay, and having passed it through, forms the bowl with a folding brass mold. The wire is then withdrawn; and after a slight dressing with a knife, the pipes, now complete, are slightly curved in the stem, and are laid by to dry for a few days, when they are removed to the kiln, which is of a peculiar construction, and consists of an interior chamber, with a number of small stages, so that the pipes can be conveniently arranged in circles without touching each other. This interior chamber can be closed so as to exclude smoke, and, in fact, is only a *seggar* on a large scale, such as is used in making pottery (q.v.). The fire acts all round it, and fires or burns the pipes without smoking them. When thoroughly baked, they undergo a kind of polishing or dressing, and are fit for sale. Finer and more expensive pipes are made of meerschaum (q.v.). Under the head of **PIPE-STICKS** will be found an account of the various materials used for making the tubes of these and other pipe-bowls. *Brier-root pipes*, now very common, have the bowl and stem made of one piece of wood; and although the stem is short, they partially absorb the oil produced in smoking, which, however, is perhaps as much the case with the common clay-pipe when it is new.

Various opinions have been entertained as to the antiquity of the practice of smoking, and consequently of the use of pipes. That pipes for smoking herbs for medicinal and other purposes were in use in England and elsewhere long before the introduction of tobacco, is tolerably certain, and the custom is still prevalent in some places. Colt's-foot, yarrow, mouse-ear, lettuce, and other plants are occasionally smoked, and no doubt have been so for centuries. A primitive kind of pipe, doubtless such as has been made generation after generation, is still in use in some remote districts. It consists of a stick of elder, from which the pith has been removed, with a bowl formed of common clay, and dried by the kitchen-fire. However much the habit of smoking herbs might obtain in Britain before that time, it is certain that to the introduction of tobacco is to be traced the rise of the trade of the pipe-maker. Pipes have been found in situations near the Roman wall in Northumberland, and other Roman stations in Britain, suggesting the idea that they were used by the Roman soldiers. But this opinion was relinquished by Dr. Bruce, the antiquary, who first propounded it; and very few now imagine that any of the pipes to be seen in the antiquarian museums of Europe are many centuries old. The names Danes' pipes, Celts' pipes, elfin pipes, fairy pipes, old man pipes, etc., are popularly given to these old pipes, but afford no evidence as to their real antiquity. Many of them are remarkable for their very small size, whence, perhaps, some of the names; but this is easily accounted for by the consideration of the very high price of tobacco when first introduced into Europe, and the manner in which it was used, the smoke inhaled by the mouth being expelled through the nostrils, so that the narcotic power of the herb was enjoyed to the utmost. Similar very small pipes have also been found in North America, and the same mode of using tobacco has always prevailed among the American Indians. See Wilson's *Prehistoric Man*, vol. ii. Stone pipes, or pipe-bowls, have also been found in Britain, cut in rude forms, and which apparently were used by the insertion of a tube, perhaps a straw. Such pipe-bowls, but elaborately carved, are among

the most remarkable American antiquities. They continue, however, to be made by the American Indians to the present day, often of stone, which are not cut without great difficulty, and are adorned with figures of men and animals. Some of them are adapted for the insertion of two tubes, that two smokers may inhale the fumes of the tobacco at once. Among some of the American tribes, the greatest care is bestowed on the ornamenting of the pipe-stem; by others, on the bowl.

The clay-pipe, much the same as is now used, probably came into use very soon after the introduction of tobacco in Britain. Aubrey, writing in 1680, says that tobacco-smokers at first used silver pipes, "but the ordinary sort made use of a walnut-shell and a straw." In the reign of William III., pipes were occasionally made of brass and of iron. Examples of these are preserved in various collections. The pipe was, in the earlier days of smoking, passed round the table—one man taking a whiff or two, and then handing it to his neighbor; thus, one pipe of tobacco would "suffice three or four men at once." It has been supposed by some writers that the smaller the pipe, the more ancient is its date; but this is decidedly an error. The better criterion of age is the *form*. The barrel-shaped bowl was most usual during the commonwealth and the reign of Charles II., although it was made in many various shapes, which are well known from representations of them in prints of the time and on the traders' tokens. In the reign of William III., a more elongated form of bowl began to be prevalent, probably introduced from Holland, although the barrel-shaped bowl still continued to be used. In the middle of the 18th c., the wide-mouthed bowl, now so universal, became the prevalent form, and the spur, which had hitherto been flat, to rest the pipe upon when in use, was elongated, after a fashion supposed also to have originated in Holland. The Scottish *cutty-pipe* and Irish *dudeen* are short clay-pipes.

The most celebrated seat of the pipe-manufacture in Britain is Broseley, in Shropshire, where it appears to have been established in the middle of the 16th c., and has continued uninterruptedly to the present day. Many hands are employed, and many gross of pipes "turned out" daily. Pipes are, however, made in many places, the clay being obtained from Purbeck.

The pipe-makers of London, as early as 1601, had privileges which gave them a monopoly. In 1619 the craft of pipe-makers was incorporated in England. Holland has long been famous for pipe making. The Dutch manufacturers were very jealous of rivalry. In the middle of the last century a pipe-manufactory was established in Flanders, and the Dutch makers determined to ruin it. The duties were too high to admit of a large importation, and they therefore freighted a large ship entirely with tobacco-pipes, set sail to Ostend, and purposely wrecked her there. In accordance with the maritime laws of that city, the pipes were landed from the wreck, and sold at such "ruinous prices" as defied competition; and the new manufactory at once sunk, and was closed.

TOBAGO, one of the Windward islands (see **ANTILLES**) belonging to Britain, lies 60 m. s.e. of Grenada, and 18 m. n.e. of Trinidad, is 32 m. long, from 6 to 9 broad, and has an area of 97 sq. miles. The island was discovered by Columbus in 1498, and named by him Assumption; the name of Tobago is supposed to have arisen from the free use of tobacco by the Caribs when first visited by Europeans. It came into British possession in 1764. From its gloomy-looking mountains, dense forests, and abrupt precipices, descending to the sea, Tobago has been called the "Melancholy isle;" but, on a nearer approach, the aspect becomes more pleasing, though still rough and irregular, being extensively occupied with conical hills and spurs, all connected by a ridge running through the interior, the greatest elevation of which is 1800 ft. above the level of the sea. From the high ridge descend deep and narrow ravines, which terminate in small alluvial plains. Scarborough is its chief town, pleasantly situated on the shores of Rochley bay, and at the base of a conical hill rising 423 ft. in altitude, crowned by fort King George. Plymouth, another town, is situated opposite Scarborough, on the leeward shore, about 6 m. distant, and is the landing-place for passengers, etc., from the royal mail-steamers. Two-thirds of the island is still covered with primitive forests, comprising many varieties of hard-woods and ornamental trees. The geological formation of the island is, on the whole, similar to that of Trinidad. The climate is considered salubrious; the thermometer ranges from 75° to 90°. The pop. in 1871 was 17,054. The island produces sugar, rum, molasses, coconuts, cotton, coffee, and indigo; pimento also grows wild. The quantity of sugar exported for the ten years preceding 1862 averaged 58,598 cwts. The value of sugar exported in 1871 was £81,104; in 1873, £37,621. In 1875 the total value of the exports was £92,015; of the imports, £67,772. The number of public schools has recently increased, and about 13 per cent of the population were receiving education—a much higher average than in the other West India islands. The island is governed by a lieutenant-governor, under the governor of Barbadoes as chief.

TOBERMORY. See **MULL, ISLAND OF.**

TOBIT, BOOK OF, one of the most curious and interesting of the Old Testament apocryphal books. It exists at present in Greek, Latin, Syriac, and Hebrew MSS., the texts of which differ considerably, yet not materially, from each other. The oldest and most valuable is the Greek Septuagint; indeed, where the others depart from it, they possess little claim to our respect, although the *original* text was certainly not Greek. When and where the book was written, are questions to which various answers have

been given; but the opinion of Ewald, who selects Persia as the scene, and the middle of the 4th c. B. C. as the date of its composition, agrees best with its internal character. The author he imagines to have been a Palestinian Jew who wrote in Hebrew, and conjectures that a translation of the work was made into Alexandrian Greek in the 1st c. B. C. That the contents of Tobit are not historical scarcely requires proof in modern times; yet up to the period of the reformation no serious difficulty was felt in receiving it as such: Luther was the first to speak of it as a "poetical," i. e., an imaginary, didactic production; and since his time biblical critics have been pretty unanimous on the point; although some contend for what they call a historical basis. The leading incidents of the story do not differ by a hairbreadth in grotesque and peurile *miraculousness* from the fantastic extravaganzas of the Arabian Nights. Tobit, sleeping outside the wall of his court-yard one night, is blinded by sparrows "muting warm dung into his eyes;" his son Tobias is attacked on the Tigris by a fish, which leaps out of the water to assail him: and marries a Jewish maiden called Sara, seven of whose betrothed lovers had been successively carried off by an evil spirit called Asmodeus. Asmodeus is driven off by an angel—who first appears under the name of Azarias, but subsequently turns out to be Raphael—and then flies to the uttermost parts of Egypt, where he is bound. Old Tobit is cured of blindness by an application to his eyes of the gall of the fish that had tried to devour his son. The sentiments are often very pious and didactic, the descriptions of social life are picturesque, and apparently true, but no excellence of that kind can reconcile us to the childish absurdities of the story.

TOBOLSK', a government of w. Siberia, occupies the n.w. angle of the country, and is bounded on the n. by the Arctic ocean, on the w. by the Ural mountains, and on the e. by the governments of Yeniseisk and Tomsk. Area, 564,825 sq. m.; pop. '70, 1086,848, mostly Russians, but including also Ostiaks, Tartars, Bokharians, and Samoiedes. Branches of the Ural and Altai mountains form a hilly region in the w. and s.e.; but the government is for the most part an extensive plain, sloping to the banks of the principal rivers and to the shores of the Arctic ocean. The chief rivers are the Ob (q. v.), and its great navigable affluents, the Irtysh, Tobol, Om, and Toura. The soil is fertile in the southern and middle districts; marshes covered with forests occupy the land n. of lat. 57°, and frozen marshes border the Arctic ocean. See **TUNDRA**. The climate, mild in the middle districts, is severe in the n., and warm in the south. Dogs, martens, ermines, silver and blue foxes, bears, deer, etc., eider ducks, geese, ducks, etc., are the principal animals. The chief crops are rye, oats, and barley. Agriculture employs the great mass of the inhabitants, except in the n., where hunting and fishing are the general occupations. The luxuriant meadows of the s. are taken advantage of for cattle-breeding. Timber, furs, and fish are the chief articles of commerce.

TOBOLSK, a town of western Siberia, capital of the government of the same name, stands at the confluence of the Irtysh and the Tobol, 1976 m. e. of St. Petersburg. It is well built, with timber houses and wide and regular streets, and its position on the two great rivers is picturesque; but its lower part is subject almost annually to inundation from the high floods of the Irtysh in spring. Its situation, considerably n. of the great commercial highway between Russia and Siberia, and at a distance from the more productive regions of the country, is unfavorable for the development of commerce. Tobolsk contains a large prison, capable of accommodating 3,000 prisoners; and the convicts condemned to exile in Siberia are first assembled at this town, and thence deported to various parts of the country. Several regiments are stationed here. Pop. '67, 20,330.

TOCANTINS, an important river of Brazil, South America, rises in the province of Goias, flows n. through the province of Para, and joins the waters of the Para (q. v.), the southern branch of the estuary of the Amazon, 130 m. from the Atlantic. Its principal affluent is the Araguay, which joins it in lat. 6° s., and has a longer course and bears along a greater volume of water than the stream to which it is tributary. The Tocantins, at its junction with the Araguay, is 5,500 ft. wide; at its mouth it is 8 m. wide. Total length, 1100 miles. The navigation, which is carried on by trading-boats resembling floating houses, is dangerous, on account of the numerous falls, sandbanks, and rapids. Boats descend from Porto Imperial (lat. 10° 30' s.) to the mouth of the Tocantins in from 20 to 30 days; the upper voyage to the same port occupies from four to five months.

TOCHER, in the law of Scotland, is an ancient name for the marriage-portion given by a father on the marriage of his daughter. It is settled according to the wish of the father, or as may be agreed with the intended husband of the daughter. Where the father by will leaves a legacy to his daughter, and afterward during his lifetime gives her a like sum as a tocher, this is not presumed to be a satisfaction of the legacy, though it is otherwise in England. See **MARRIAGE**.

TOCQUEVILLE, ALEXIS CHARLES HENRI CLEREL DE, a French statesman, and the most eminent writer of this century on the science of politics, was born at Verneuil, in the department of Seine-et-Oise, July 29, 1805. His father was the representative of an old family, the Clerels, proprietors of Tocqueville, in Normandy. The Clerels, although in the direct line *noblesse d'épée*, had been closely connected with the magistracy, and, indeed, might be considered to belong more properly to that order, which in France has

produced so many distinguished men. The mother of De Tocqueville was a granddaughter of Malesherbes, the academician, political writer, and magistrate, who defended Louis XVI. at the bar of the Convention, and whose fearless intrepidity was punished by the execution of himself and all the most distinguished of his relatives. Mme. de Tocqueville and her husband narrowly escaped the guillotine by the fall of Robespierre; but they did not emigrate, like other royalist families, and they preserved their property. At the restoration in 1815, the father of De Tocqueville re-assumed the title of count, which belonged to the family before the revolution. Young De Tocqueville was called to the bar at Paris in 1825; and after a short tour in Italy, entered the magistracy as *juge auditeur* at Versailles. In this situation he carefully studied the administrative system of France; and, struck by the perpetual recurrence of revolution, devoted much thought to political questions. In 1831 he threw up his appointment at Versailles, and with his colleague there, M. Gustave de Beaumont, accepted a government mission to America, to report on the working of the penitentiary system. The commissioners, after their return to Europe, published their report (*Du Système pénitentiaire aux Etats-Unis*, 1832; Eng. transl., Philadelphia, 1833)—an admirable work, which modified all the ideas previously entertained in France regarding prison-discipline. But this was not the most important result of their inquiries. In 1835 De Tocqueville published his great work, *De la Démocratie en Amérique* (Eng. transl. by Reeve, London, 1835). In his introduction he sought to show that a great democratic revolution has for centuries been going on in Europe. There is a general progress toward social equality, which must be looked on as a providential fact. In France it has always been borne on by chance, the intelligent and moral classes of the nation never having connected themselves with it, in order to guide it. In America he found that the same revolution has been going on more rapidly than in Europe, and has indeed nearly reached its limit in the absolute equality of conditions. There, accordingly, he thinks we may see what is about to happen in Europe. He points out that the people in America may be strictly said to govern. They make the laws and administer them. He draws from what he has observed the conclusion, that democracy may be reconciled with respect for property, deference for rights, safety to freedom, and reverence for religion. He does not propose the laws and manners of the Americans for the imitation of other democratic peoples. He merely seeks, by a faithful picture of an existing democracy to allay the dread of democratic progress, and to induce those at the head of affairs to recognize it as irresistible, and to seek to control it by wise concessions. *The Democracy* made at once a great sensation. The accuracy of the statements, the skill with which the matter had been digested, and the beauty of the style, were loudly praised by critics. The author was described as the continuator of Montesquieu, and the greatest political writer of his time. He became successively a member of the academy of moral sciences and of the French academy. In 1835 De Tocqueville visited England, where his work had made him known, and where he received an enthusiastic welcome from the leaders of the whig party. In the same year he married Miss Motley, an Englishwoman. He shortly afterward, by a family arrangement, entered into possession of Tocqueville. He stood in 1837 as candidate for the representation of Valognes in the chamber of deputies. His opponent was a retired mill spinner, who raised the cry of "No nobles" against him. Alluding to the great dovecot of Tocqueville, his opponent said: "Prenez garde! Il va vous remener les pigeons." De Tocqueville was defeated; but two years after he had become a great favorite with his neighbors, the Norman farmers, and they returned him to the chambers by an overwhelming majority. As a speaker, De Tocqueville did not succeed, but he exercised great influence on the legislature. Immediately after the revolution he was the most formidable opponent of the socialists and extreme republicans. He opposed Louis Napoleon as a man who believed in his right to throne as firmly as Charles X. He became, however, in 1849, vice-president of the assembly; and from June to October in the same year, minister of foreign affairs. At this time he vindicated the policy of the expedition to Rome, on the ground, it must not be forgotten, that it would secure liberal institutions to the states of the church. After the *coup d'état*, he returned to Tocqueville, where he devoted himself to agricultural pursuits. He there wrote *L'ancien Régime et la Révolution* (Par. 1856; Eng. transl., London and New York, 1856), a work worthy of his fame. In June, 1858, he broke a blood vessel, and was obliged to leave the bleak coast of Normandy for a warmer climate. He took up his abode at Cannes, where Lord Brougham and chevalier Bunsen spared no effort to soothe his lingering illness. He died there April 16, 1859. De Tocqueville's *Œuvres et Correspondance Inédites* were published in 2 vols. (1860), by his friend M. de Beaumont, who prefixed a biographical notice. The English translation of this work appeared at London and New York in 1861.

TOD (derivation unknown), a weight for wool, now unused; it was fixed at 28 lbs. avoirdupois in 1671.

TODARS, **TODAWARS**, or **TUDAS**,* a remarkable race inhabiting the upper part of the Neilgherry mountains (q.v.), in southern Hindustan. They are rapidly diminishing

* "Written also *Toda*, *Thoda*, *Thodarur*. The name of a pastoral people inhabiting the Nilghiri mountains, and claiming to be the original occupants and proprietors of the whole of the hilly country."—Dr. H. H. Wilson's *Glossary of Indian Words*.

in number, chiefly owing to the practice of polyandry (q.v.), and their not allowing intermixture with other races; in 1853, it appears that only 337 were left. They are tall, well proportioned, and athletic, with finely molded limbs, and bold, independent carriage; the nose aquiline, with black, bushy hair and beard. The dress of the men consists of a single toga, worn so as to leave the right arm free, not unlike the plaid of the Scottish Highlander. Both sexes are of a dull copper color, but the women are rather fairer than the men, and are often tall and handsome in feature and person. They have no occupation except tending their herds of buffaloes, and converting the milk into butter. The buffalo, indeed, is so important to them, that they look on the pen where the herd is cooped up at night with superstitious veneration. They never attempt the cultivation of the land around them, as they obtain what grain they require from the Burghers and other agricultural tribes, who pay it in the shape of tribute (*goodoo*) for the lands they cultivate, over which the Todars assert an imaginary right. The Todars hold that their ancestors were the aboriginal inhabitants of these regions (see INDIA, *Inhabitants*); that the Kothers, and afterward the Burghers, came among them; and that they allowed these tribes to cultivate land on condition of paying a goodoo of one-sixth of the harvest. The Burghers continue to pay their tribute of grain, but only in such amount as suits their own wants and inclinations, and rather in the shape of charity than otherwise. The only use the Todars get of the buffaloes, besides their milk, is to furnish sacrifices to the manes of the dead. They are wont to salute the sun at his rising and setting, and believe that the soul after death goes to the "great country." They have no distinct places of worship, except the hut in which they keep their milk, where they pour out in libations to their deities what remains after their daily consumption. They have never been known to steal the smallest article. No civil servant, or native of any of the other tribes, has ever been able to acquire their language, which has no written character, and not the slightest affinity with Sanscrit. Their mode of collecting the goodoo is singular enough: "As soon as harvest is over, and the goodoo collected in Todanaad, the Toda men of that division pay visits to the munds (villages, or groups of huts) in Meyleanaad and Paranganaad, and take up their abode with the women of the community (to the temporary exclusion, as is the custom, of the legitimate husband). They then pay visits to the surrounding Burgher villages, and demand in their right, as temporary husbands of the women of the naad, the goodoo, which, strange to say, is paid; and thus the same man, perhaps, who has laid a whole village in his own naad under contribution, goes the round of the other two naads, appropriating the fruits of the Burghers' labor and industry, and carrying off enough grain to support his whole community in idleness and plenty until the arrival of the next year's harvest-time, and to produce by sale in the nearest bazaar sufficient money to pay the tax which is levied yearly on their tribe. I should have refused credence to such a statement, had I not received it on the best authority, that of the tahsildar of the district."—See *Statistical Memoir of a Survey of the Neilgherry Mountains*, laid before the select committee on colonization, etc., in 1853, ordered by the house of commons to be reprinted, 1861; capt. Harkness's *Description of a Singular Aboriginal Race*, etc., 1832; capt. Burton's *Goa and the Blue Mountains*, 1861.

TODD, a co. in s.e. Dakota; drained by the Missouri and Niobrara rivers; about 575 sq.m.; pop. '70, 337—229 of American birth. The surface is diversified. The soil is productive; but little of it as yet is under cultivation. Co. seat, Fort Randall.

TODD, a co. in s.w. Kentucky, adjoining Tennessee; drained by Pond river, Elk creek, and other streams; traversed by the St. Louis and South eastern, and the Louisville and Nashville railroads; 350 sq.m.; pop. '80, 15,998—6,566 colored. The surface is hilly. The soil is fertile. The principal productions are tobacco, wheat, corn, and cattle. Co. seat, Elkton.

TODD, a co. in central Minnesota; drained by the Partridge and Long Prairie rivers; traversed by the Northern Pacific railroad; 950 sq.m.; pop. '80, 6,133—4,693 of American birth. The surface is level. The soil is fertile. The principal productions are wheat, oats, butter, and live stock. Co. seat, Long Prairie.

TODD, HENRY JOHN, 1763—1845; b. England; graduated, Oxford, 1785; vicar of Milton, 1792; rector of All-Hallows, London; keeper of the mss. at Lambeth palace, 1803; rector of Settrington, Yorkshire, 1820; prebendary of York, 1830; arch-leacon of Cleveland, 1832. He published among other books, *Poetical Works of John Milton*, with notes and a life; *The Works of Edmund Spenser*, with notes and a life; *Illustrations of the Lives and Writings of John Gower and Geoffrey Chaucer*; a new edition of *Johnson's Dictionary*; *Life of Archbishop Cranmer*.

TODD, JOHN, D.D., 1800—73; b. Vt.; graduated Yale college, 1822, and Andover theological seminary, 1826; Congregational pastor at Groton, Mass., 1827—31; of the Edwards church, Northampton, 1833—36; of the First Congregational church, Philadelphia, 1836—42; of the First church, Pittsfield, Mass., 1842—70. He was one of the founders of Mount Holyoke female seminary. He published, *Lectures to Children*; *Student's Manual*; *Index Rerum*; *Sabbath School Teacher*; *Truth Made Simple*; *Great Cities*; *Lost Sister of Wyoming*; *Young Man*; *Simple Sketches*; *Stories on the Shorter Catechism*; *Summer Gleanings*; *Daughter at School*; *Bible Companion*; *Future Punish-*

ment; Mountain Gems; The Water Dove, and other Gems; The Angel of the Iceberg; Nuts for Boys to Crack; Polished Diamonds; Hints and Thoughts for Christians; The Great Pacific Slope. He had a vigorous and original mind, much practical shrewdness and wit, and fine descriptive power.

TODD, THOMAS, 1765-1826; b. Va.; served in the revolutionary army when but a boy, and in 1786 moved to Kentucky. He practiced as a lawyer at Danville, was clerk of the district court and court of appeals, and judge of the latter, 1801-06. In 1806 he was made chief-justice of the state, and the following year a justice of the U.S. supreme court, which position he retained until his death.

TODDY, the name given in the East Indies to the fermented juice of various palms from which arrack (q.v.) is distilled. The name has been adopted in Britain for a mixture of whisky, sugar, and hot water, which forms the national drink of Scotland and Ireland. See SPIRIT.

TODI, a t. in central Italy, in the province of Perugia, 30 m. e. of the city of that name; pop. 14,934. It is surrounded by the ruins of Etruscan walls, and is built on a high hill overlooking the river Tiber. It has a Gothic cathedral with frescos by Le Spagna, and the ruins of a temple belonging to the Roman era. In 552 it was the scene of the decisive battle of Narses against Totila the Goth, in which the latter was killed, and the Goths defeated—this victory leading to the capture of Rome.

TODIDÆ, or the **TODIES,** a family of tropical birds, of the tribe *plissirostres*, of the order *inscsores*. Some of the groups are restricted to South America and the West Indies; others to India and the Eastern archipelago. They are birds of showy plumage and rapid flight. Their food consists of worms, small reptiles, insects, and occasionally berries. The *rollers* are the only representatives of the tribe in temperate parts of the old world, and they differ considerably from the common form, the bill being much longer and narrower than in the tropical todies. One species, the *garrulous roller*, is an occasional visitor of the British isles. It is about the size of a blue-jay, and is a beautiful bird. The more typical todies have short rounded wings, short tail; tarsi long and slender; toes three in front and one behind, well developed; claws short and well curved. Except while breeding they are solitary. They are said to make their nests in holes in the ground, laying from three to four eggs. Five species are enumerated by Sharpe.

TODLEBEN, FRANZ EDWARD, Russian gen. of engineers, was b. at Mitau, Russian province of Courland, in 1818. After studying at Riga, he was admitted as a student in the college of engineers at St. Petersburg. He was 2d capt. in the engineer corps when the Russian army entered the Danubian principalities in 1853, and served in the campaign of the Danube under gen. Schilders. His genius as a military engineer was discovered before the Russian army crossed the Pruth, on its retreat from the principalities; and when the French and English troops undertook the siege of Sebastopol, col. Todleben was sent to assist in its defense. It was in the middle of April when he arrived, and the fortifications were soon placed under his direction. The principle on which he acted was to watch the works of the allies, and to establish against them on every point a superiority of fire, by multiplying the number and increasing the caliber of his guns. The prodigious activity displayed by the Russians in making good the damage sustained by the heavy fire of the enemy, filled the allied army with astonishment. Everywhere, massive ramparts of earthworks, mounted with formidable batteries, rose up as if by magic at each threatened point within the line of defense. According to Todleben, the defense was rapidly asserting an engineering superiority over the attack. The Malakoff, however, was carried by assault, and the allies entered Sebastopol (see *History of the Russian War* (illustrated), W. & R. Chambers). At the battle of Inkermann, Todleben, who was on the spot by chance, seeing that the Russian artillery was in danger of being taken, promptly halted a regiment, and caused four guns to open fire on the allies, and gave time to the artillery to retreat. At the latter part of the siege he was wounded in the leg, but all his great defenses had then been completed. Since the conclusion of peace, he has expanded what was at first a mere engineer's report into a history of the war in the Crimea. It is entitled *Défense de Sebastopol: ouvrage rédigé sous la Direction de Lt.-Gen. E. de Todleben, aide-de-camp général de S. M. l'Empereur.* In this work he writes a thoroughly Russian account of the Crimean war. In all that relates to the Russian army and its labors, and especially in regard to the work of the siege, the author may be accepted as an unimpeachable authority; but where the British and French armies are concerned, he is too often careless and inexact, and sometimes his statements are absolutely untrue. For services in the siege he was created a gen. and decorated. In 1865 he visited England, and was cordially received. He performed distinguished service in the war with Turkey in 1877-78.

TODMORDEN, a market-t. of England, in the co. of Lancaster, on the border of Yorkshire, 8 m. n.e. from Rochdale, on the Manchester railway. The town is well built, has several churches and schools, and manufactures of cotton. Coal abounds in the vicinity. The town proper of Todmorden is composed of houses belonging to three townships, the pop '71, being 11,998.

TOFFEE, or **TOFFY,** a sweetmeat made of sugar, melted with about half its weight of butter. Much care is required in making it, to insure its being crisp when cold. It

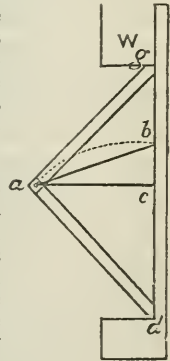
should be kept over the fire and slightly simmered for a quarter of an hour, when small drops are taken and let fall on a marble slab to cool quickly for trial; if they become brittle, it is complete. Everton, near Liverpool, has a name for its toffee.

TO'GA (from Lat. *tego*, to cover) was the principal outer garment of the Romans, and originally, perhaps, the only one. Subsequently, an under-garment, the *tunic*, was added. It was probably of Etruscan origin, and yet it came to be considered the distinctive badge of the Roman citizen, whence the Roman people are called *togati*, or *gens togata*; and consequently, when the Cisalpine Gauls received the rights of citizenship, their country was spoken of as *Gallia togata*, in opposition to transalpine Gaul, or *Gallia braccata* (breeched). At first it was apparently semicircular in shape—so, at least, say Dionysius, Quintilian, and others—but afterward, when it came to be an elaborate and complicated dress, it must have been a smaller segment than a semicircle. The mode of wearing the toga is difficult to describe, and required considerable art to make the folds fall gracefully. The toga was made of woolen cloth, and except in the case of mourners, was of a white color. Accused persons sought to excite sympathy by going about in a soiled (*sordida*) and unsightly toga; while those who were seeking office were wont to dress themselves out in garments which had been made artificially bright by the help of chalk, hence their name of *candidati* (lit. shining ones), candidates. The *toga prætexta* had a broad purple border, and was worn by children, and most though not all of the magistrates. The *toga picta*, so called from being ornamented with embroidery, was worn by generals when enjoying their "triumphs." Under the emperors, the toga, as an article of common wear, fell into disuse, the Greek *pallium* and other garments being used instead; but it continued to be used by officials on solemn or festive occasions.

TOGCEL, on shipboard, a short bar of hard wood tapering from the middle toward each end, placed in an eye at the end of a rope, as a convenient obstacle to the rope passing through a loop or knot.

TOGGENBURG, or **TOCKENBURG**, a district in Switzerland, within the canton of St. Gall, formed by the long and fertile valley of the Thur. It was formerly governed by counts of its own, who ranked as the richest and most powerful land-proprietors in the country. On the extinction of their line in 1436, the possessions passed to the barons of Rasen, who sold them in 1469 to the abbot of St. Gall. Since 1803 Toggenburg has formed part of the canton of that name. The valley is thickly peopled by an industrious race, who carry on the manufacture of muslin and cotton. The most interesting spot in the whole region is Wildhaus, in the Johannisthal; a little mountain village more than 2,000 ft. above the level of lake Zürich, where Ulrich Zwingli, the Swiss reformer, was born.

TOGGLE JOINT, a mechanical appliance sometimes called a mechanical power, acting on the principle of the inclined plane, as will be seen by the following demonstration. Let *ad* and *ag* represent the arms of the toggle joint, with the joint at *a*. Then, if the arms are brought to a perpendicular, the end *d* being stationary, the point *a* will move through the arc *ab* to *b*, and at each point in the arc in the direction of a tangent at that point. As the point *a* approaches *b* the tangent will become more and more horizontal, and at last perpendicular to the arms *ad* and *ag*. When they form one and the same straight line the weight *w* will have been raised to twice the height *bc*. The form in the figure here presented is given to show more clearly the action of the knee and elbow joints in man, but that which is more frequently used, particularly in hay and cotton presses (to which the appliance is peculiarly adapted) makes the ends *d* and *g* of the arms approach each other, applying the power at *a*, making *ac* the perpendicular. It will be seen that on the application of power the motion of the point *a* will at first be quite rapid (when the hay or cotton is loose) becoming slower and slower as the points *d* and *g* approach each other, so that when both arms become very nearly perpendicular the weight, or resistance will move very slowly; but the power will be extremely great, and adapted to the resistance offered by the greatly compressed bale. See **INCLINED PLANE**, *ante*.



TOISE, in the ancient French system of measures, was the unit of linear dimension, and was divided into 6 ft., each foot (*pied*) into 12 in., and each inch (*pouce*) into 12 lines (*lignes* or *points*). It is equivalent to 1.94903659 French meters, or to 6.3946 English feet.

TOKAT, a t. of Turkey in Asia, w. from Trebizond, and 60 m. from the s. shore of the Black sea, stands at the mouth of a defile, on the banks of a small stream. It is inclosed by mountains on three sides, so that in summer the heat is intolerable. Gardens and vineyards extend along the slopes of the valley to the distance of 3 m. above the town. The town consists principally of wooden huts, disposed in narrow and dark streets. It was formerly a place of considerable trade, but its importance as a commercial mart has declined. Extensive copper-furnaces, however, in which copper ore, brought from near Diarbekir, by means of mules and camels, is melted, still exist, and

give employment to many persons. Cotton-printing and dyeing are also carried on. Pop. 35,000

TOKAY, a species of wine obtained from the vines which grow on the Hegyallya mountains, a group stretching n. and n.e. of Tokay. The Tokay wine-district comprises about 15,000 English imperial acres, the produce from the Mezesmali, a detached rounded eminence near Tokay, being most esteemed. Great care is bestowed on the proper assortment of the grapes (which are never gathered until fully ripe): and also on the preparation of the wine—of which about 34 sorts are reckoned; but all of these may be grouped into the two classes of sweet and dry. The wine is brownish yellow while new, changing to a greenish hue as it grows older. The average annual produce of the Tokay vineyards is 1,500,000 imperial gallons of the dry, and 50,000 gallons of the sweet wines. Tokay enjoys an immense reputation on the continent for its great restorative and tonic qualities; and so much is it esteemed in Hungary, that every considerable proprietor for miles round makes it a point to acquire some property in this vine-district, that he may be able to procure his wine from his own vineyards. On this account, genuine Tokay, is obtainable by wine-merchants only in small quantity (and this is especially the case with the more valuable sort, the sweet or imperial Tokay), and is largely mixed with inferior wines, to increase the amount. The vine-gathering is celebrated at Tokay, Maad, and Tallyn, the three chief places of the district, as a national fête, to which the magnates of Hungary with their families flock from all quarters; and during the season of festivity, many times more than the whole value of the vintage is expended. The crowd of visitors is swelled largely by the wine-dealers and medical agents, who eagerly buy up such lots as are for sale, and sometimes give the most extravagant prices for imperial or other good qualities of wine. Large quantities of "imitation" Tokay are made by French and German chemists, and sent to all parts of Europe, not excepting Hungary itself, so that purchasers require to guard against imposition by dealing only with the grower or his accredited agent.

TOKEN, the name given to the kind of money which was at certain periods current in Britain by suzerainty, and not by royal authority. Tokens first came into use in England in the reign of Henry VIII., in consequence of the want of any authorized coins to represent the fractions of a penny; and in the reign of Elizabeth, stamped tokens of lead, tin, and even leather, issued by vintners, grocers, and other tradesmen, passed largely from hand to hand, and were payable at the shops where they were issued. The corporations of Bristol, Oxford, and Worcester, had also their tokens. In 1613, a royal proclamation authorized lord Harrington to issue farthing tokens, and prohibited the use of private tokens under penalties. This prohibition was renewed by Charles I., who granted to the duchess of Richmond, sir Francis Crane, and others, the exclusive right of coining authorized farthings for seventeen years; but the farthings made by these patentees were the subject of much discontent, as they were greatly below the intrinsic value of the metal. In the face of these prohibitions, private tokens, principally of brass, continued to circulate, and were especially abundant during the civil war. Numerous tradesmen's tokens, mostly of copper, were again struck during the scarcity of money at the close of the last century. On account of the scarcity of current silver money, previous to the new coinage of 1817, silver pieces known as bank tokens, of the respective values of 5s., 3s., and 1s. 6d., were issued by the bank of England; they were called in on the revision of the coinage.—See Chamber's *Book of Days*, vol. i. p. 535.

TOKIO, or YEDO (pronounced Edo, "River-door"), since 1868 called TOKIO ("Eastern capital"), the chief city of Japan, is situated in the e. of the mainland, at the head of the bay of the same name, in lat. 35° 26' 30" n., and long. 139° 39' 24" east. The river O-gawa, or Great river, divides it into an eastern and western portion, the latter being by far the larger and more important. For postal and general municipal purposes Tokio has of late years been divided into six great sections, each of which is subdivided into from eleven to fifteen districts. Five of these sections lie to the w. of the river O-gawa: the sixth, lying to the e., forms the most densely populated part of an extensive suburb, which is for the most part farm-land, but also contains a great number of large timber-yards, brick-kilns, etc., and is ramified by a vast network of canals. These canals also serve to join O-gawa with Naka-gawa, which latter river bounds the above-mentioned suburb to the e., and by which a great deal of produce is brought to the capital from the interior. The O-gawa is a large and rapid river, and is spanned by six wide bridges, whose lengths range from 250 to 350 yards. In 1878, however, a return was made to the old district names, two of which, Honjo and Fuku-gawa, lie between O-gawa and Naka-gawa. Under the Shogun (mistakenly called Tycoon, see JAPAN), Tokio proper was divided into O-shiro, or the citadel; Soto-shiro, outside the citadel; and Michi or streets. In O-shiro was the palace of the Shoguns, which, repeatedly burned and rebuilt, was again destroyed by fire in 1872. But the beautiful large parks surrounding it are maintained in good order, and here it has been proposed to build a new palace for the mikado or emperor.

Soto-shiro which engirdles O-shiro, is partly occupied by palaces and temples; and the more eastern part of it is intersected by the Tokaido, the most important high-road through Japan. It also contains Dai-gaku, the modern imperial university, where native youths get a liberal education and college training for the professions of law, medicine,

engineering, and industrial chemistry; as also Koku-dai-gakko, which is a special school for engineers. One of its numberless bridges is called Nihon-bashi ("bridge of Japan"), and is considered the center of the empire, all geographical distances being reckoned from it. The third of the old divisions of the city forms the exterior part of the city, and contains among others the temple of K'wanon, the most venerated and frequented in all Japan; that of Confucius, which under the Shoguns was the national university for the study of Chinese literature, and is now converted into a public library of native, Chinese, and European books; and that of Kanda-Niyojin, the tutelary deity of the city. In this division also is Yoshiwara, the most popular of the five districts of Tokio, set apart for prostitutes.

The population of Tokio was formerly much greater than it is now, because of the Shogun compelling every daimio, or clan-prince, to live in Tokio for a great portion of the year with a large body of retainers. This custom being, of course, extinct since the revolution of 1868, the population has sunk to between 700,000 and 800,000. The area covered by the capital, however, is about 28 sq. m.; and therefore Tokio, in point of extent, is after London the largest city in the world. It is situated in a great plain, which extends n. and s. about 100 m., and from the coast to the mountains from 20 to 60 miles. This plain is one of the most fertile in Japan, and is tilled with great skill and laborious care, irrigation and manuring being adopted to the fullest possible extent. It is traversed by many large rivers, from one of which an abundant water supply is brought to Tokio, a distance of 40 miles. Smaller streams intersect the plain in every direction, and form rich and lovely valleys, the ridges between which rise at very few places to more than 200 ft. above sea-level. Tokio is connected with Yokohama by railway, and a large extent of telegraphic line now keeps it in close communication with the s., n., and w. of the empire. In recent years a very eager desire for the acquirement of European knowledge of science, industry, and political and social philosophy has been manifested by the people. The classes of the recently established colleges of the capital are crowded with enthusiastic and industrious students. Immense improvement has been made both in the lower and the higher education of the people. In 1873 there were only 12,597 elementary schools, with 1,326,190 pupils. In 1875 the number of schools had increased to 24,225, and the pupils to 1,925,206. Of the 34,000,000 of Japanese subjects, 15.2 per cent are reckoned as of school-age—namely, from 6 to 14 inclusive, and 35.4 per cent of this elementary-school population were in the schools in 1875. Although external evidences of superstition abound in Japan, nothing illustrates the small practical influence superstition has upon the daily actions and thoughts of the Japanese people more forcibly than the marvelously rapid progress that rational European *medical* science has made in Japan, not merely in the education of a large body of intelligent and well-qualified physicians and surgeons, but still more remarkably in the confidence and faith in the doctors of the new school displayed by the people at large.

The main body of the new imperial army is located and drilled in the capital. Its creation after the great revolution of 1868 was superintended by French officers. There is a large arsenal, well stocked with excellent modern machinery, in Tokio; and also a naval college, where cadets for the marine service receive a good scientific education and practical training.

Much of the former glory of old Yedo has vanished, many stately palaces and rich temples having been burned to the ground, or allowed to fall into decay. But the chief natural beauties of the city remain—the 30 m. of tortuous moats, with their summer blaze of lotus-flowers, and the exquisitely beautiful parks and gardens with their luxuriant flowers and rich wooding.

During the winter there are almost nightly fires in Tokio. In 1858 a single fire destroyed fully one-quarter of the whole city; and in one night in 1876, 8,000 houses were burned. The whole business part of the city is studded with clay fire-proof store-houses, into which all the chief valuables are hurriedly thrust immediately upon the breaking out of a fire in the neighborhood. The massive iron doors and shutters of these fire-proof "doya" are, as soon as the interior is filled, cemented air-tight. Lighted candles having been placed inside before the closing of the last door in order to exhaust the inflammable oxygen of the inclosed air, the building may be left to be raged round by the flames of a dozen burning houses crowded about it, and may even be raised to a red-heat without there being any danger of combustion taking place inside. The houses burned down, being of a light wooden construction, are rebuilt with what appears to a stranger incredible rapidity.

In Tokio, as in other important towns of Japan, the use of gas for street and shop lighting is gradually extending. There are numerous papers (including a dozen dailies) and periodicals published in Tokio; but although many of them are cleverly edited, the press suffers severely from government censorship. A considerable export trade in silk, silk-worms' eggs, copper, lacquer-work, mats, timber, etc., passes through Tokio, the goods being shipped at Yokohama. The bay of Tokio is shallow, permitting only small craft to approach the city at high tide.

H.B.M.'s Consular Reports for 1870-79; Adam's History of Japan; Griffis' Mikado's Empire; Aimé Humbert's Japon Illustré; Maurice Dubard's Japon Pittoresque; Sir Rutherford Alcock's Capital of the Tycoon; Oliphant's Narrative of Lord Elgin's Mission; The Treaty Ports of China and Japan; Mossman's New Japan.

TOLAND, JOHN, a well-known deistical writer, of the 17th and 18th c., was b. near the village of Redcastle, in the co. of Londonderry, Ireland, Nov. 30, 1669 (or 1670). His parents were Roman Catholics, and he was brought up in that religion. His baptismal name was James Junius; but the ridicule which it drew upon him at school, led him to change it into John, by which he is now known. He was educated at Redcastle, and entered the university of Glasgow in 1687, but removed to that of Edinburgh, where he took the degree of master of arts in 1690. Thence he passed to Leyden, where (having abandoned at Edinburgh the Roman Catholic faith) he entered upon theological studies with a view to orders as a nonconformist minister. One of his masters at Leyden was the celebrated Spanheim. He remained there about two years, during which time he made the acquaintance of Leibnitz and some other distinguished men; and on his return to England, he resided for some time at Oxford, where his extravagant vanity, and the reckless boldness of his opinions on religion, drew on him much notice. In the Bodleian library, he collected the materials of more than one of his later publications, and prepared in great part the work entitled *Christianity not Mysterious*, which he published in London in 1696, and in which he fully avowed his unbelieving principles. The work created a great sensation in the theological world. It was censured by convocation, and led to several replies (among which, those of Payne and Stillingfleet may be specially noticed); and in the following year, Toland resolved to return to Ireland, sending before him a large number of copies of his work; but he was received no less unfavorably than in England, and his book was burned publicly by the common hangmen, in virtue of an express vote of the Irish parliament. Finding it necessary to flee from Ireland, Toland returned to London, where he published a defense against this judgment of the Irish parliament; but he soon afterward turned his pen from theological to political and literary subjects. A pamphlet entitled *Anglia Libera*, on the succession of the house of Brunswick, led to his being received with favor by the princess Sophia at the court of Hanover; and to his being sent on a kind of political mission to some of the German courts.

During his residence abroad, he published in 1702 a vindication of his book against the judgment of the convocation, the tone of which was considerably more moderate; but again, in 1705, he outstripped the boldness of his former opinions, and with still less of disguise, openly avowing himself a pantheist. In this course he was emboldened by the patronage of Harley, in whose service he had engaged as a political pamphleteer, and by whom he was sent abroad to Holland and Germany in 1707, in a capacity which, however he disavowed it, was plainly that of a political spy. He returned to England in 1710; and having forfeited the favor of his patron, or at least having separated from him, he engaged as a partisan pamphleteer on the side of Harley's adversaries.

His after-life was that of a literary adventurer, and was checked by every variety of literary conflict and pecuniary struggle. It forms one of the most curious and painful chapters in Disraeli's *Calanities of Authors*. He resided from the year 1718 at Putney, where he died, Mar. 11, 1722, in his 52d or 53d year; and it is observed by Disraeli, that on his table was found an *Essay on Physics without Physicians*, which he was writing, in revenge for the unskillful treatment which he himself had suffered in his malady.

Of his works, which were very numerous, but have never been collected into a uniform edition, the following are the most remarkable: *Christianity not Mysterious: a treatise showing that there is nothing in the Gospel contrary to Reason, nor above it* (Lond. 1696); *Apology for Mr. Toland* (1697); *Life of Milton*, prefixed to Milton's works, 3 vols. folio (1698); *Anglia Libera, or the Limitation and Succession of the Crown explained and asserted* (1701); *Vindicus Liberius, or Mr. Toland's Defence of Himself against the Lower House of Convocation* (1702); *Socinianism truly stated* (1705); *Reasons for Naturalizing the Jews* (1714); *State Anatomy of Great Britain* (1714); *Nazarenus, or Jewish, Gentile, or Mahometan Christianity* (1718). A detailed account of these works would be out of place, but they all exhibit in a general way the characteristics described above. His posthumous works were published in 2 vols. 8vo, in 1726, with a life by Des Maizeaux. An *Account of Toland's Life and Writings*, ascribed to Curle, had previously appeared in 1722. It should be added that the above list is far from containing all the writings of this now little known, but once active and notorious polemic.

TOLEDO, a city of Ohio, finely built on the estuary of the Maumee river, near the western extremity of lake Erie, 92 m. w. of Cleveland, and 53 m. s.w. of Detroit. It has a fine harbor, and very extensive railway connections; and is the terminus of the Miami and Erie, and Wabash and Erie canals, together 700 m. in length. The local and transit trade is immense. It has 45 churches, a convent, 3 asylums, 3 daily and 9 other newspapers, large warehouses, machine-shops, foundries, flour-mills, etc. Its commerce in 1870 was in exports, 1,836,782 dollars; imports, 283,329. Its 10 grain elevators can store 4,017,000 bushels. In 1874 the deliveries of grain amounted to 39,304,591 bushels. Pop. '70, 31,731.

TOLEDO (*ante*), the co. seat of Lucas co., Ohio, on the Toledo, Canada Southern and Detroit, the Toledo and Maumee Narrow Gauge, the Toledo, Delphos and Burlington, the Toledo and Grand Rapids, the Toledo and North-western, the Toledo, Peoria and Warsaw, the Toledo and Ann Arbor, the Lake Shore and Michigan Southern, the North-western Ohio, and the Wabash, St. Louis and Pacific railroads; pop. '80, 50,143. Its

area is about $21\frac{1}{2}$ m., of which much the greater part is on the w. bank of the river. The city is regularly laid out with wide streets, having many fine public buildings and private residences. It has several lines of horse-railroad, a paid fire-department, with steamers and the electric fire-alarm, and a system of stand-pipe water-works, built at a cost of \$1,000,000. It has many large hotels, schools, banks, and a free public library. The many railroads meet in a grand union depot. Immense amounts of grain and flour are received and shipped; and great elevators with a capacity of several million bushels have been built. Among other articles of which great quantities are received are iron, cotton, hides, live stock, and provisions. There are many large wholesale dealers in dry-goods, furnishing goods, cutlery, crockery, hardware, lumber, boots and shoes, groceries, etc. The manufacturing interests of Toledo are varied and extensive, and include the largest wagon factories in the country, iron foundries, planing-mills, sash and blind factories, car factories, molding factories, breweries, boiler-shops, steam-engine shops, pump factories, brick-yards, etc. Toledo has a produce exchange which holds daily sessions. The first settlement was made in 1832, and the town was incorporated in 1836.

TOLEDO, a famous city of Spain, capital of the province of the same name, and long the capital of the whole country, stands on the n. bank of the Tagus, by which it is encompassed on three sides, 55 m. s.s.w. of Madrid by railway. It is situated on a number of hills at the height of about 2,400 feet above sea level; and the climate, excessively hot in summer, is bitterly cold in winter. The Tagus is the great fortress of the town. Rushing round it, on the e., s., and w., between high and rocky banks, it leaves only one approach on the land-side, which is defended by an inner and an outer wall, the former built by the Gothic king Wamba, in the 7th c.; the latter by Alfonso VI. in 1109, and both remarkable for the number and beauty of their towers and gates. Seen from a distance, the city has a most imposing appearance; within, it is gloomy, silent, inert, and its narrow streets are irregular, ill-paved, and steep. In the middle of the city rises the lofty, massive cathedral, surrounded by numerous churches and convents, mostly deserted, for here the churches are without congregations, and the streets and walks are almost destitute of people. The cathedral, completed in 1492, and built on the site of a former mosque, is a large edifice, in simple, pointed Gothic. It was ransacked and plundered in 1521 and 1808, but previous to these events, its interior was of the most magnificent description. The stained glass that remains is superb; the choir is a perfect museum of high-class sculpture; and there are two pulpits of metal, gilt, the workmanship of which is as fine as that of the richest plate. The cathedral is 404 ft. long, and 204 ft. wide; and has 5 naves, supported on 84 piers. Connected with the cathedral are an extraordinary number of chapels, of great interest, alike from their architectural beauty, their decorations, and their historical associations. The Zocodover, "square market," thoroughly Moorish in its architectural character, is a fashionable promenade, and was for years the site on which heretics were burned, and bull-fights took place. The *Fábrica de Armas*, or manufactory of Toledan swords, a huge, rectangular, unsightly building, standing on the right bank of the Tagus, was erected in 1788, though long before that time the Toledan blades had become famous, and the fondness of the Iberians for their weapons, as well as the weapons themselves, were written about both by Livy and Polybius. The temper of the best Toledan blades is such, "that they are sometimes packed up in boxes, curled up like the mainspring of a watch." The buildings of the town also include a theological seminary, military school, female college, hospitals, and manufactories of coarse woolens, paper, guitar-strings, and leather. Pop. '45, 13,431; '65, 25,000.

Toledo, the *Toletum* of the Romans, is of very early origin, and was taken by Marius Fulvius in 193 B.C. It was the capital of the Goths during their dominion; in 714 it fell into the possession of the Moors, who retained it till 1085, when it was permanently annexed to the crown of Castile. In the days of its highest prosperity, it is said to have contained 200,000 inhabitants.

TOLEDO WAR, a dispute between the state of Ohio and the then territory of Michigan, which arose in 1835 from questions as to boundary. Congress in the ordinance of 1787 had reserved the right to form new states out of the part of territory n.w. of the Ohio river "lying n. of an e. and w. line drawn through the southerly bend or extreme of lake Michigan." Ohio was admitted as a state in 1805, the above line being described in the act as its n. boundary, though the state constitution claimed more territory. The true latitude of the bend was not given in Mitchell's map, and when in 1805 Michigan territory was organized, and, later, Indiana and Illinois became states, the most confused ideas existed on the boundary question. A survey was made by order of congress in 1817 which established the present line. The old line had included in Michigan the city of Toledo, and this was the main point in dispute. In 1835 Ohio laid claim to all within the new or Harris line, and proceeded to organize townships. Michigan declared the intention of resisting such invasion, and the militia of both sides was called upon to maintain the alleged rights of their respective governments. An opinion of the U. S. attorney-general, B. F. Butler, favored Michigan; president Jackson sent out a "peace commission" with no result, and serious conflict seemed imminent. In Sept., 1835, the Michigan troops occupied Toledo to prevent the formal organization of

Wood co. by Ohio officers. The latter, however, accomplished their purpose secretly and withdrew. The trouble was finally settled by the admission of Michigan into the union on condition of accepting the Harris line, while as a make-weight that state was given the upper Wisconsin peninsula, which afterward proved from its mineral wealth to be far more valuable than the disputed territory.

TOLENTINO, *Tolentinum*, a city of central Italy, province of Macerata, 11 m. s. of Macerata on a rising ground, left bank of the Chienti. It has a fine cathedral dedicated to St. Nicholas, and a town-hall with ancient inscriptions, a statue of Agrippina, and several good paintings. Tolentino has been a bishop's see from the 5th century. In the Parisani palace at Tolentino Pius VI. signed a treaty with Bonaparte in 1797, by which the pope ceded Bologna, Ferrara, and the Romagna to the cisalpine republic. Under the French empire, it formed part of the department of Musone. Here Murat was defeated by the Austrians, 1815. Pop. 5,000.

TOLERATION is the liberty which, in some countries where a particular form of religion is established by law, is allowed to nonconformists to publicly teach and defend their theological and ecclesiastical opinions, and to worship whom and how they please, or not at all. But no permission is thereby given to violate the rights of others, or to infringe laws designed for the protection of decency, morality, and good order, or for the security of the governing power. The enforcement of this class of laws, which have merely civil and political objects in view, is indispensable to the public welfare, and must proceed without regard to the notions of religious duty which their contraveners may entertain or profess. In Britain, there are still in force certain statutes imposing penalties on opinions and practices generally regarded as impious, and which were thought to be criminal because of their offensiveness to God (see **BLASPHEMY**); but these laws are seldom executed now, the opinion having become prevalent, that, except when the religious feelings of the public are so wantonly outraged as to make the perpetrator a nuisance, theological error is best opposed by refuting it, and that when those accused of heresy (q.v.) are men of piety and earnest conviction, any degree of severity short of extirpation tends rather to diffuse than to suppress their tenets. Besides, the right of private judgment in matters of faith and worship is now more generally recognized in *practice* than it used to be, though such is human pride that even yet many resent the exercise, by their neighbors who differ from them, of the freedom which they claim for themselves. They seem to forget the maxim that we should do to others as we would have others to do to us—a principle admirably applied by St. Paul to the case of religious differences (Rom. xiv.), and which indeed is the only one that has been found to work well in all circumstances for every sect; it condemns not only political disabilities and restraints unwarranted by the exigencies of the state, but still more, that uncharitable treatment through which, almost exclusively, the spirit of intolerance can now find a vent in free Protestant countries. Were it not for the inconsistency thus displayed in our own day by many professing advocates of the right of private judgment, it might seem wonderful that the Reformers, by whom that right was first asserted, and who on no other ground could justify their separation from the church of Rome, became in their turn the persecutors, not only of the Romanists, who had persecuted them, but of such fellow-Protestants as had drawn from Scripture conclusions that differed from their own. Instances of such inconsistency on the part of the Reformers and their successors will be found in the articles CALVIN, SERVETUS, SOCINUS, BIDDLE, and JEWS. In a church claiming infallibility (q.v.), and believing that salvation is unattainable beyond her pale, it is not only consistent, but to her most earnest members must seem a duty, to prevent by force the spread of what is accounted a fatal heresy; and, in fact, toleration has never been either professed or practiced by the church of Rome. See ALBIGENSES, WALDENSES, DOMINICANS, INQUISITION, HUGUENOTS, BARTHOLOMEW'S (St) DAY, NANTES (EDICT OF), CEVENNES, DRAGONNADES. But even the Puritans (q.v.), though long oppressed themselves, were so blind to the right of others to differ from them, that in their own brief day of power they eagerly repudiated, by word and deed, as a monstrous and impious error, the principle of a universal toleration. In the assembly of divines (q.v.) held at Westminster in 1643-46, the Presbyterian members fought successfully against the proposal of the Independents that all sects should alike be tolerated. "We hope," wrote Baillie to his Presbyterian friends in Scotland, "that God will assist us to remonstrate the wickedness of such a toleration. . . . For this point, both they and we contend *tanquam pro aris et focis*" (Baillie's *Letters*, ii. 328, 350; Bannatyne club ed.: see also the strong expressions of George Gillespie, another member of the assembly, in his *Propositions concerning the Ministry and Government of the Church*, prop. 41 and 42). We accordingly find in the 23d chapter of the *Westminster Confession* an assertion of the duty of the magistrate to promote the true religion, and to restrain and punish heterodoxy—a principle which, soon after the restoration, was found to work very inconveniently for the Presbyterians themselves, the magistrate being then one who differed from them as to what the true religion was. The Independents, on the other hand, had learned the lesson of toleration in Holland—that nursery of liberty in modern Europe—whither they had fled from oppression in the reign of James I.; and it is a mistake to suppose, as some have done, that they were the first to understand and practice the principles of religious freedom. In the 16th c., Zuinglius and the Hunga-

rian reformer Dudith, disclaimed, by word and action alike, the notion that any man is entitled to assume, in his dealings with others, that his own interpretations of Scripture are true, and those of other men, if different, false and culpable. "You contend," wrote Dudith to Beza, "that Scripture is a perfect rule of faith and practice. But you are all divided about the sense of Scripture, and you have not settled who shall be judge. You say one thing; your opponent, Stancarus, says another. You quote Scripture; he quotes Scripture. You reason; he reasons. You require me to believe you; I respect you; but why should I trust you rather than Stancarus? You say he is a heretic; but the papists say you are both heretics. Shall I believe them? . . . You say that your lay hearers, the magistrates, and not you, are to be blamed, for it is they who banish and burn for heresy. I know you make this excuse; but tell me, have not you instilled such principles into their ears? . . . Do you not daily teach that they who appeal from your confessions to Scripture ought to be punished by the secular power? . . . When you talk of your Augsburg confession, and your Helvetic creed, and your unanimity, and your fundamental truths, I keep thinking of the sixth commandment—"Thou shalt not kill." In the history of England, also, from the Reformation to the Commonwealth, there is, as bishop Heber has observed, "abundant proof that (much as every religious party, in its turn, had suffered from persecution, and loudly and bitterly as each had, in its own particular instance, complained of the severities exercised against its members) no party had yet been found to perceive the great wickedness of persecution in the abstract, or the moral unfitness of temporal punishment as an engine of religious controversy. Even the sects who were themselves under oppression exclaimed against their rulers, not as being persecutors at all, but as persecuting those who professed the *truth*; and each sect, as it obtained the power to wield the secular weapon, esteemed it also a duty, as well as a privilege, not to bear the sword in vain."—*Life of Jeremy Taylor*, p. 27. It is chiefly to the many keen discussions in Holland and England during the century which followed the restoration (aided, no doubt, by that moderation or indifference which characterized the Protestant churches a hundred years ago—by the ever-increasing number and power of the dissenters—and by that wider mental culture which enables men not only to see that diversity of mental gifts and acquirements naturally leads to diversity of opinion, but, in Cromwell's language, to "think it possible they may be mistaken"), that we must ascribe the tolerant spirit now actuating most of the statesmen of England and the United States, and which has lately made rapid progress among the people at large. Not only is the *right* of free thought and discussion now generally recognized, but its *necessity* to the well-being of mankind is asserted by eminent thinkers. Mr. John Stuart Mill, in his able treatise *On Liberty*, thus sums up the grounds on which the necessity of such freedom is affirmed by him: "1 If any opinion is compelled to silence, that opinion may, for aught we can certainly know, be true. To deny this, is to assume our own infallibility. (2) Though the silenced opinion be an error, it may, and very commonly does, contain a portion of truth; and since the general or prevailing opinion on any subject is rarely or never the whole truth, it is only by the collision of adverse opinions that the remainder of the truth has any chance of being supplied. (3) Even if the received opinion be not only true, but the whole truth; unless it is suffered to be, and actually is, vigorously and earnestly contested, it will, by most of those who receive it, be held in the manner of a prejudice, with little comprehension or feeling of its rational grounds. And not only this, but (4) the meaning of the doctrine itself will be in danger of being lost, or enfeebled; and deprived of its vital effect on the character and conduct; the dogma becoming a mere formal profession, inefficacious for good, but cumbering the ground, and preventing the growth of any real and heartfelt conviction, from reason or personal experience" (p. 95).

See Jeremy Taylor's *Liberty of Prophesying*; Milton's *Areopagitica*, his *Treatise of Civil Power in Ecclesiastical Causes*, and his treatise *Of True Religion, Heresy, Schism, Toleration, etc.*; Dr. John Owen's *Indulgence and Toleration Considered*; Barclay's *Apology for the Quakers*, prop. 14; Locke's *Letters concerning Toleration*, and treatise *On the Conduct of the Understanding*; bishop Heady's *Sermons, and Dedication to Pope Clement XI.*; Ibbot's *Boyle Lectures on the Right Duty, Benefits, and Advantages of Private Judgment*; Paley's *Moral Philosophy*, b. 6, ch. 10; Sydney Smith's *Letter to the Electors on the Catholic Question*; D'Israeli's *Curiosities of Literature*, article "Toleration;" Hallam's *Literature of Europe* (Part iii. ch. 2); Whately's *Essays on the Errors of Romanism, etc.*; J. Blanco White *On Heresy and Orthodoxy*; Brook's *History of Religious Liberty*; James Martineau's *Rationale of Religious Inquiry*; Samuel Bailey's *Essays on the Formation of Opinions, and On the Pursuit of Truth*; Taylor's *Retrospect of the Religious Life of England*; Edgar Taylor's *Book of Rights or Constitutional Rights and Parliamentary Proceedings affecting Civil and Religious Liberty in England, from Magna Charta to the Present Time*; and *The Edinburgh Review*, vol. 76, p. 412.—In regard to the manner in which the early Christians became liable to punishment under the Roman laws, see Neander's *History of the Christian Religion and Church*, vol. i. p. 118, Bohn's ed.; Gibbon's *Decline and Fall of the Roman Empire*, ch. 16, compared with ch. 2; Dr. Taylor's *Elements of Civil Law*, App.; and the articles ANTONINUS (MARCUS AURELIUS) DECIUS, and PERSECUTIONS, in the present work.

TOLERATION, ACT OF. See ACT OF TOLERATION.

TOLL (Gr. *telos*, a public tax; Gr. *telonion*, Lat. *telonium*, a toll-house; Ang.-Sax. *tol*, Ger. *zoll*, seem related to the root Ger. *zahl*, Eng. *tell*, to count, to pay), a payment exacted under a royal grant, or some prescriptive usage, or by express statute; such as by the owner of a port for goods landed or shipped, by the owner of a market or fair for articles sold, or by those charged with the maintenance of roads, streets, bridges, etc., for the passage of persons, goods, or cattle. It is essential in a toll that it be for some reasonable consideration; otherwise, it is void. In modern times, the right to take toll is always created by statute, and nothing short of statutory authority will authorize its levy, for it is a species of tax.

Many tolls receive special names, as dues, customs, etc.; and the term toll is now mostly used in connection with turnpike roads (so called from the turnpike or gate turning on an upright axis or pike, at which the tolls are collected) and bridges. See HIGHWAY.

The first express authorization of a road-toll on record bears date 1346, when a commission was granted by king Edward III. to lay a toll on carriages passing from St. Giles to Temple Bar, and also on carriages passing toward Portpool, now Gray's Inn Lane, London, the roads in those places having become impassable from want of other provision for their maintenance. From that small beginning, the turnpike system gradually spread itself over all England, and latterly over Scotland and Ireland. The earliest Scottish turnpike act was passed in 1750. Previously, by statutory enactments in 1617, 1661, and 1669, the Scottish highways were made and maintained by what is called the "statute-labor" system, under which the laboring population could be called on to give six days' work yearly upon the roads in their parishes. This poll-tax, either in the shape of personal labor, or of conversion-money in lieu of it, remained in force, in regard to all but turnpike roads, till 1845, when the general statute-labor amendment act (8 and 9 Vict. c. 41) abolished it, and substituted assessments on land.

Beginning with 1750, turnpike roads gradually spread over Scotland, under authority of about 400 separate acts of parliament, till there was a very considerable mileage; and in Ireland the turnpike system extended over all the kingdom. According to a parliamentary report in 1840, there were in England and Wales 104,772 m. of turnpike roads; and a similar report for Scotland in 1859 gives 5,768 m. of turnpike roads in that kingdom, with 1060 toll-gates thereon. The original erection of toll-gates excited violent opposition in many parts of the country, and their maintenance has frequently led to popular violence and rioting.* Even those who are sensible that good roads are worth paying for at any reasonable cost, have all along felt the toll-system to be an annoyance and obstruction to traffic, from the continual stoppages to pay or exhibit tickets; often unjust in its application; and unnecessarily expensive. The wastefulness of the turnpike system is astonishing to think of. The local acts of parliament, and the constantly recurring litigation, is a serious expense, to begin with; but the chief waste is in the machinery for collecting the revenue. Besides the erection and maintenance of toll-houses and gates (one for every 6 to 8 m.), there were, at the census of 1871, about 5,000 persons employed in England and Scotland as toll-collectors; and assuming these to be heads of families with five persons in each, there are (or were) 25,000 individuals to be maintained, which must absorb a high percentage of the revenue levied on the public.

In 1845, Mr. William Pagan of Cupar-Fife published a plan of "road reform," in which he directed public attention to the evils of the toll-bar system, and advised its discontinuance, the substitute proposed by him being a rate on horses, or an assessment on the lands and heritages in each county and burgh, for the support of all roads (statute-labor roads included) and bridges within the respective counties and burghs.

Ireland, which was studded all over with gates on its turnpike roads, took the lead in toll-bar abolition. The roads in the s. of Ireland were the first cleared of gates; Dublin and its environs followed; and an act was passed in 1857, abolishing the whole of the remaining toll-bars; and by April 5 following, the toll-bar system, and all its costs and charges and vexations, disappeared from Ireland. There, the supporting of the roads by land-assessment is much preferred to the defunct toll system. The Isle of Man also is overspread with excellent roads, with no tolls upon them. The financial management of roads by turnpike trustees in England and Scotland has proved eminently unsuccessful, there being some years ago a debt on the turnpike roads in England to the amount of about four millions sterling, and in Scotland, to the amount of two millions and a half.

The question of toll-bar abolition has been much agitated in England—the inconvenience of the system becoming every day more sensibly felt since the introduction of railways. The efforts of the anti-toll association of London have succeeded in freeing the suburbs of the metropolis, and a considerable space on both sides of the Thames, from 153 toll-gates. In recent years, annual acts of parliament have passed in England, gradually effecting the extinction and winding up of many turnpike trusts which have been long insolvent in all parts of the country. In Scotland several attempts were made

* Notably in South Wales, in 1843, where a band of conspirators, calling themselves Rebeccaïtes, (in allusion to Gen. xxiv. 60), carried on the systematic demolition of toll-gates and houses for nearly a year.

after the roads commissioners' report of 1859, to obtain a general act, compulsory or permissive, for the abolition of tolls within the kingdom. Various counties obtained acts for themselves, for maintaining their roads and bridges by assessment on lands and heritages—the rule usually being, that the proprietors should clear off any debt on the roads, and that the maintenance should be divided between proprietors and tenants. The counties which obtained abolition acts, are: Aberdeen, Banff, Caithness, Cromarty, Elgin, Dumfries, Haddington, Kirkcubright, Nairn, Peebles, Ross, and Wigton. Argyle, Bute, Orkney, Sutherland, and Shetland never adopted the toll-bar system, but maintained their roads by assessment, or by grant from government. Special acts passed to regulate the Inverness roads in recent years. By the passing of the roads and bridges act, 1878, tolls will be altogether abolished in Scotland in 1883, and any time before then in such counties as voluntarily adopt the act, whose main provisions are similar to those adopted by the counties which had previously abolished tolls. Toll revenues have diminished, from the diversion of the through traffic to railways; while the chief costs, and notably that of collection, remain as great as before. Notwithstanding the prejudices, and narrow mistaken views of personal and local interests, which continue to resist this, as they have resisted most other important reforms, the remainder of the toll-bar system must give way, and the word "toll," as applicable to collection of moneys at gates on public roads, become obsolete.

TOLLAND, a co. in n.e. Connecticut, drained by the Willimantic and other small rivers, traversed by the New York and New England, and the New London Northern railroads; about 450 sq.m.; pop. '80, 24,112—19,399 of American birth. The surface is diversified, and fairly fertile. Tobacco and corn are raised, and the butter is noted for its excellence. Co. seat, Tolland.

TOLLENS, HENDRIK, the most popular Dutch poet of modern times, was born at Rotterdam, Sept. 24, 1780. At the early age of 14, his father, a merchant in dyestuffs, placed him in his counting-house, and first looked favorably upon, but afterward discouraged the boy's poetical efforts. The sympathies of young Tollens were at that time with what was called the patriotic party, who thought that the entrance of the French, in 1795, would be the cure for all political evils, and he made many verses in the spirit of the times. In his 17th year, he began to study English, German, and Latin; but French literature was his favorite study, and translations of French tragedies his chief work. At 19, he published translations from the French poets, under the title of *A Nosegay of Fragrant Flowers culled on French Ground*. Three years later, appeared his *New Songs and Idyls*, in which he first came out as an original poet. Shortly after, followed another collection of miscellaneous poems, which showed more marked progress; in 1805, his tragedy of *Lucretia*; and in 1806, that of the *Hockschen and Kabeljaavreschen*, or the contest between the nobility and the towns in Holland, in the olden time—both original pieces of great merit. In 1804 Loots carried off first prize, and Tollens the second, for a poem on Hugo de Groot; and in 1806, the order was reversed, when both again sung the deaths of counts Egmont and Hoorn. There flowed from his pen an uninterrupted series of songs and poems, in which the warmest feelings were expressed in the most natural and chaste language. Of these may be mentioned, as a few gems, "William I.," the "Victory at Nieuwpoort," the "Four Days' Naval Fight," the "Cry to Arms in 1815," the "Wintering of the Dutch in Nova Zembla," and the "National Song of the Netherlands," which is an echo of the calm but patriotic spirit of the people. His deep fellow-feeling with his countrymen is seen in the poems which he wrote during the Belgian revolution in 1830-31, as in the heart-stirring poems, "The Evening Prayer," and "The General Prayer-day." The popularity which Tollens attained, his poems reaching the fifth edition in 1831, arose chiefly from his singing of subjects always dear to the heart of the nation—of family-life, country, religion, and love—and that in simple, unartistic language, and pure Dutch style. The people loved the poet because they understood him, and his words touched their hearts. Tollens published *Romances, Ballads, and Legends*, (1818); *New Poems* (1821-29); *Songs of Claudius* (1832); *Poetical Flowers gathered from Neighboring Nations* (1829); *Scattered Poems* (1840); two volumes (1850), in which, though advanced in life, the tone of his lyre was more beautiful, powerful, and rich than ever. Tollens died at Rijswijk, Oct. 21, 1856.

Of modern Dutch poets, Tollens stands in the first rank. The wintering in Nova Zembla is the most wonderful piece of descriptive poetry in the Dutch language. Tollens was an excellent man, distinguished for his sincere piety and benevolence. His compassion for the poor comes out in his *Bedelbrief*, or begging-letter, which he published for the benefit of the distressed in the severe winter of 1844-45. While the people's poet, he was also God's priest for spreading Christian love among men. In early life, Tollens belonged to the Roman Catholic church, and in 1827 joined the Protestant Remonstrants; but both before and after the change, he was essentially a religious man.

TOLNA, a co. in s.w. Hungary, adjoining Pesth, Baranya, Veszprem, and other counties; 1407 sq.m.; pop. '70, 220,740. It is drained by branches of the Danube, its e. boundary. The surface is mostly level, and fairly fertile, but the e. part is sandy; wine, tobacco, fruit, corn, and flax, are the staples. Capital, Szegszard.

TOLISA, a t. in the n. of Spain, capital of the province of Guipuscoa, 15 m. s. of the sea-port of San Sebastian. It stands in a deep valley watered by two streams, and

abounds in old family mansions. There is a royal factory for arms, and in the vicinity are zinc and lead mines. Pop. about 5,000.

TOLTECS or **TULHUATECAS**, a Mexican nation, who, according to Mexican tradition came from some other country to Anahuac in the 7th c., and established the kingdom of Tula. They were followed by the Chicimecs, by the Nahuatl tribes, and last of all by the Mexicans. The Toltecs, who are represented as the first civilized people in Mexico, were of the same race as the Nahuatl tribes. Their numbers were thinned by pestilence, and in the 11th c. wars between the nobility and clergy destroyed the Toltec kingdom. Many of the Toltecs removed to Guatemala, where they founded another monarchy; and the Quichés derived their ancestry from them. The Toltecs remaining in Mexico were incorporated with the Chicimecs, who were of a different race.

TOLU. See **BALSAM.**

TOLUCA, a t. of Mexico, capital of the state, and 20 m. s.w. of the city of Mexico, about 8,800 ft. above the sea; is handsomely built; with fine arcades lining the streets. The plain on which it stands is fruitful in maize and other products. Pop. 12,000. Near the town is the volcano of the same name.

TOMAHAWK, a light war-hatchet of the North American Indians. The early ones were rudely made of stone, ingeniously fastened to their handles by animal sinews, or cords of skins. European traders supplied hatchets of steel, the heads of which were made hollow, for a tobacco-pipe; the handle of ash, with the pith removed, being the stem. These hatchets are used in the chase and in battle, not only in close combat, but by being thrown with a wonderful skill, so as always to strike the object aimed at with the edge of the instrument. The handles are curiously ornamented. In the figurative language of the Indians, to make peace, is to bury the tomahawk; to make war, is to dig it up.

TOMATO or **LOVE-APPLE**, *Lycopersicum esculentum*, a plant of the natural order *solanaceæ*, formerly ranked in the genus *solanum*, and known as *S. lycopersicum*. The genus *lycopersicum* is distinguished by a 5—6-parted calyx, a wheel-shaped 5—6-cleft corolla, 5 stamens, and a 2—3 celled berry, with hairy seeds. The tomato is an annual, from 2 to 6 ft. in height, requiring support when tall. The leaves are unequally pinnate, the leaflets cut; the flowers numerous, followed by berries, which are very various in shape and color—generally red and yellow—in different varieties. The plant is a native of the tropical parts of America, but is now much cultivated in all parts of the world suitable for it, as the s. of Europe and the United States. In Britain, it requires a hot-bed in spring. The fruit is much used for sauces, catsup, preserves, confectionary, and pickles. The unripe fruit makes one of the best of pickles. Tomatoes appear with almost every dish in Italy. The use of them is rapidly increasing in Britain and other countries.

TOMB (Gr. *tumbos*), a monument erected over a grave, in order to mark the resting-place, and preserve the memory of the deceased. In early ages, and among eastern nations, it sometimes became the practice to place the remains of the dead in excavated sepulchers, whose interior was often decorated with painting or otherwise. Where the usage was to burn the dead, their bones and ashes were placed in urns in these receptacles. Some of the most remarkable rock-tombs were those of Egypt, belonging to the 18th and following dynasty of the Theban kings. The monarch's burial-place began to be excavated as soon as he ascended the throne, and the excavation went on year by year, the painting and decoration progressing till the king's death, when it was suddenly broken off, the tomb thus becoming an index both of the king's magnificence and of the length of his reign. The most costly articles are often found in these sepulchers. The decoration was almost entirely reserved for their interiors, the façades being comparatively unobtrusive. On the other hand, the rock-tombs of Persia and Lycia, less rich and elaborate internally, have imposing architectural façades, those of the Persian kings being copied from their palaces; and during the Roman period, this species of magnificence prevailed at Petra (q.v.) to an extent that gives that now deserted valley the aspect of a city of the dead. See also **ERRURIA**.

Tombs, in more modern times, have generally been mounds or masses of building raised over the remains of the dead. In the Homeric poems, heaps of cairns of stones are placed as honorary memorials above the graves of departed heroes. The sepulchral mound (q.v.) or tumulus of rude ages is found over the greater part of northern Europe, and is probably older than the subterranean tomb. The pyramids (q.v.) were the sepulchers of the Egyptian monarchs from the 4th to the 12th dynasty. The tombs of Greece, and still more those of the Greek colonies in Asia Minor, were sometimes pillars, or upright stone tablets, sometimes small buildings in the form of temples. The most celebrated was the *mausoleum* (q.v.). The Roman tombs were not unfrequently important architectural structures, varying in form, but oftenest consisting of a circular tower resting on a square basement; familiar examples being the tomb of Cæcilia Metella, and the yet larger and more solid tomb of Hadrian, on the banks of the Tiber, best known as the Castel St. Angelo, which is about 220 ft. in height, and of immense solidity. In Rome, Latium, and Magna Græcia, tombs were generally erected outside the towns, and

along the principal roads leading into the country, as in the Via Appia at Rome, and the street of tombs at Pompeii. A form of excavated tomb, without external architecture, called *columnarium* (q.v.) was also in use in Rome, whose walls were pierced with cells to receive cinerary urns. The prevalent circular tomb became in the later period of the Roman empire polygonal; and the central chamber, at first small, was gradually increased, till, in the age of Constantine, it became something like a miniature representation of the Pantheon, generally with a crypt below the principal apartment.

In the earlier centuries of Christianity, the burial of the dead in churches was prohibited. The first step which led to its adoption was the custom of erecting churches over the graves of martyrs; then followed the permission to kings and emperors to be buried in the church porch. The most important tombs of the middle ages are generally within churches or cloisters. There is much variety in the form and enrichment of mediæval tombs. The earlier examples consists of a single stone coffin, or sarcophagus, often with a low gabled lid and sculptured cross. An altar-tomb, or tomb in the form of a table, followed; and in the 13th c., a species of tomb was introduced, consisting of a sarcophagus, on which rests a recumbent figure of the deceased, the whole being surmounted by a canopy, often of exquisite symmetry and richness. In the renaissance period of art, the tombs became more and more complex. The sarcophagus was disguised, or made the least important part of the monument; the representation of the deceased was confined to a medallion likeness, and the most prominent part of the tomb was composed of sculptured upholstery, and groups of symbolical and eventually mythological figures. In some of the 16th c. examples, as Michael Angelo's tombs of Giuliano and Lorenzo di Medici, at Florence, the inappropriateness of the design is partly redeemed by the beauty of the figures; but in the succeeding centuries, the vicious taste of these monuments rapidly increased, till it culminated in some of the hideous tombs that disgrace Westminster abbey and St. Paul's.

TOMBAC, or **WHITE-COPPER**, is an alloy formed of about 75 parts of copper and 25 parts of arsenic; it is used in the manufacture of buttons, and is a very beautiful metal.

TOMBIGBEE RIVER, one of the streams which unite to form the Mobile river; rises in Tishomingo co., n.e. Mississippi; flows through Mississippi and Alabama in a generally s.e. but very irregular course, about 450 m., and joins the Alabama river about 45 m. above Mobile. It is navigable as far as Aberdeen, Miss.

TOMBOOC'TO. See **TIMBUCTOO**, *ante*.

TOMCOD, a common name in the United States for the species of the genus *microgadus*, having the general external characteristics of the common cod-fish; three dorsal and two anal fins, a barbel on the chin, and teeth on the vomer. The species on the Atlantic coast is *M. tomcodus*; on the Pacific, *M. proximus*. They are brought to some of the markets, but are not highly esteemed.

TOM GREEN, a co. in s.w. Texas, formed in 1875, including Bexar district, having New Mexico on the n.w. and the river Pecos on the w. and s.w. The surface is mountainous. Co. seat, Ben Ficklin.

TOMMASEO, NICOLÒ, 1803-74; b. Dalmatia; resided for some time in Florence, was exiled to France in 1833, and removed to Venice in 1838. During the revolutionary movement of 1848, he was arrested, but was soon released by the people, and became minister of public worship and education. After the Austrians resumed control in 1849, he was again exiled, and the rest of his life was spent at Corfu, Turin, and Florence. Among his works are a dictionary of Italian synonyms; *Canti Popolari* (1843); *Studi Critici* (1845); and *Poesie* (1872).

TOMPKINS, a co. in s.w. central New York, drained by Fall, Salmon, and other creeks; traversed by the Southern Central and other railroads; 475 sq.m.; including part of Cayuga lake; pop. '80, 34,445—32,269 of American birth. There is much woodland, and the soil is fertile. Taughannock Falls, 9 m. n.w. of Ithaca, are 190 ft. high, said to be the highest falls in the state. Co. seat, Ithaca.

TOMPKINS, DANIEL D., 1774-1825; b. N. Y.; graduated Columbia college, 1795; admitted to the bar in New York, 1797; a member of the legislature and of the state constitutional convention, 1801; member of congress from New York city, 1804; resigning to become a judge of the state supreme court; governor of New York, 1807-17; vice-president of the United States, 1817-25; delegate to the state constitutional convention, 1821. He supported the national government in the war of 1812, and commanded the third military district, contributing much by furnishing troops to the national success. In a message to the legislature, 1817, he recommended the total abolition of slavery in the state of New York, and an act was passed to take effect July 4, 1827. Owing to carelessness in keeping his accounts during the war he was accused of being a defaulter, and in his last days was a victim of melancholy and intemperance.

TOMSK, a government of western Siberia, bounded on the e. and n.e. by the government of Enisei or Yeneseisk, and on the n.w. and w. by that of Tobolsk. Area, 324,275 sq.m.; pop. '70, 838,756. Tomsk, more than any other government of Siberia, abounds in lakes and rivers. Of the latter, most of which flow northward from the foot of the Altai mountains, the principal are the Ob, Tom, Chulim, and Irtysh. The largest lakes,

which are both sweet and brackish, occur in the Barabinsky steppes. The climate is mild in the middle and southern districts, but severe in the north. Sandy and clayey soils prevail; but there are patches of good mold on which abundant crops of grain, of various kinds, as well as hemp, flax, and tobacco, are raised. The extensive mountain slopes and plains are covered with luxuriant forests, in which the most common trees are the broad-leaved oak, the cedar, and the pitch-tree. The natural products of the country are numerous. In the s. and e. parts, droves of wild horses and herds of horned cattle are a source of considerable wealth. But the mineral products of the country are its chief source of riches. Manufactures are not extensively carried on; there is a large barter-trade with China, and the commerce of the country is maintained for the most part by means of fairs.

TOMSK, a trading t. of Siberia, capital of the government of the same name, on the Tom, a tributary of the Ob, 2,809 m. e. of St. Petersburg, in lat. 56° 30' n., and long. 84° 58' east. Situated on the great trading highway of Siberia, it is the seat of an important transit trade, chiefly with the Kalmucks and Mongols; but the goods that pass to and from Irkutsk also go by way of this town. There are upward of 50 manufactories, chiefly for soap, leather, and distilled liquors, and the most important commercial article is furs. It is said to be the richest town in Siberia; and its commercial importance, its extent, and the number of its handsome buildings are increasing annually. Pop. in '67, 24,431.

TON, a suffix of frequent occurrence in the names of Anglo-Saxon settlements. It seems to be from the same root as the Gothic *tainus*, meaning a twig (allied to which are the *tine* of a fork, the *tines* of a stag's horns, the *tines* of a harrow) the Anglo-Saxon *tyuan*, to hedge, and the Ger. *zaun*, a hedge. "Hence, a *tun* or *ton* was a place surrounded by a hedge, or rudely fortified by a palisade. Originally, it meant only a single homestead or farm, and this use of it is still common in Scotland. In modern English, in the form of *town*, it is applied to a collection of houses. Similarly with *ton*, the terminations *worth*, *fold*, *garth*, *burgh*, and others also convey the notion of inclosure, protection."—See I. Taylor's *Words and Places*.

TON, the same word as *tun* (q.v.), denotes a weight of 20 hundred-weight (*cwt.*). In Britain, the hundred-weight contains 112 lbs., so that the ton contains 2240 lbs. In the United States the hundred-weight is usually reckoned at 100 lbs., and the ton at 2000 lbs. In both countries, 40 cubic ft. of rough or 50 of hewn timber constitute a ton or load of the same. The hundred-weight (*centner*) in Austria, Prussia, Denmark, Germany, and Switzerland, contains 100 lbs.; in Hamburg, 112; in Bremen, 116; its representative in France, Spain, and Portugal, is the quintal (q.v.); in Italy, the centinajo; in Turkey, Egypt, n. Africa, and the Balearic isles, the Kantar (124 lbs.).

STONE, in music, the name given to the larger intervals in the diatonic scale, so called in contradistinction to the *semitones* (q.v.), or smaller intervals. Theoretically, some of the intervals called tones are larger than others, and none of them are equal to two semitones; thus, in the scale of C, the intervals CD, FG, and AB, are all equal; but DE and GA, which are also called tones, are smaller; and the semitones, EF and BC, are larger than half even of the larger tones. In instruments, however, which are tuned according to the equal temperament (see **TEMPERAMENT**), all the tones are made equal, and each equivalent to two semitones.

STONE, THEOBALD WOLFE, 1762-98; b. Dublin; graduate of Trinity college, Dublin; called to the bar in London, 1789. He belonged to the whig party and wrote a number of political pamphlets. He was a Roman Catholic and endeavored to influence members of that church to unite with dissenters against the government, and published, 1791, *An Argument on behalf of the Catholics of Ireland*. He was one of the founders of the first club of United Irishmen at Belfast, and similar organizations in other parts of Ireland; sec. and agent of the Roman Catholic committee, 1792; implicated in Jackson's proceedings, but allowed to go at large, and came to this country in 1795. In the following year he went to France for assistance and returned suddenly to Ireland, recalled by rumors of a revolt. In the expedition to Bantry bay he was adjt. gen. to the commander, Hoche, but the fleet was driven off the coast and scattered, thus discouraging the French, who abandoned the enterprise. In 1798 he set sail for Ireland with Moreau's army, and was defeated by an English fleet, taken prisoner, court-martialed, and having been sentenced to be hanged, cut his throat with a pen-knife to preclude the event.

TONGA BAY, a small inlet on the e. coast of Africa, bounded on the n. by cape Delgado, and extending inland in a n. direction. Cocoa-nut trees and jungle line the shores of the bay, and at its head is the village of Tonga, small and insignificant, but important from its frontier position. Cape Delgado is the northern limit of the Portuguese colonial possession of Mozambique; and the village of Tonga, which is situated n. of the parallel of lat. of the cape, is in the possession of the Seyyid of Zanzibar, and is the most southern possession of that sovereign.—*Despatches from Her Britannic Majesty's Consul and Political Agent, Zanzibar*, 1863.

TONGA ISLANDS AND TONGATABU. See **FRIENDLY ISLANDS**.

TONGRES, a very ancient city of Belgium, in the province of Limbourg, 13 m. s.e.e. of Hasselt. Its church of Notre Dame, the first dedicated to the Virgin n. of the Alps, dates from 1240; and the cloister attached, the oldest in the country, was built in the 10th century. The mineral spring in the vicinity, of which Pliny wrote. "*Purgathic corpore tertianus febres discutit, calculorumque vitia*," still retains its ancient virtues. Various manufactures are carried on. Pop. 7,200.

TONGUE, THE, is a symmetrical muscular organ, extending from the hyoid bone backward and downward, to the lips in front, and occupying the buccal cavity. The superior surface, borders, and anterior third of the inferior surface are free; while the remaining parts are attached to adjacent parts by the investing mucous membrane and subjacent structures. At certain points, this membrane, on leaving the tongue, forms distinct folds, containing fibrous or muscular tissue, which act to a certain extent as ligaments to the tongue. The most considerable of these folds is termed the *frænum* (or bridle) of the tongue, and connects its anterior free extremity with the lower jaw. It acts as a strong ligament, and limits the backward movement of the tip of the tongue. In rare cases, this ligament extends abnormally to the tip, so as to interfere with speech and mastication, and the child is said to be *tongue-tied*; recourse must be then had to division of the *frænum*, popularly known as *cutting the tongue*. Other folds of mucous membrane (the *glosso-epiglottid* folds) pass from the base of the tongue to the epiglottis; while from the sides of the base, passing to the soft palate, are seen two folds on either side, known as the *pillars of the fauces*. See PALATE. The *superior surface* of the tongue is divided into two symmetrical lateral parts by a median longitudinal furrow, commencing at the tip, and extending back about two-thirds of the tongue's length. The various kinds of papillæ which are seen on their surface are described in the article TASTE, ORGAN AND SENSE OF. At the back of the surface, just behind the circumvallate papillæ, are large mucous glands, extending into long and capacious canals, and helping to secrete the fluid that moistens the tongue. On the *inferior surface*, the longitudinal furrow, which extends from the tip to the *frænum*, is deeper than on the upper surface; on each side of it veins are seen running forward; and immediately beneath the tip is a cluster of mucous glands, known as the glands of Nuck (their discoverer in 1690). The *posterior extremity or base*, is flattened and extended laterally before it is inserted into the *hyoid bone* (known also as the *lingual* or *tongue bone*), which, with certain ligaments, must be regarded as the basis or framework of the tongue. The muscles of the tongue are usually divided into two groups—viz: the *extrinsic* muscles, which attach the tongue to certain fixed points external to it, and move it on them; and the *intrinsic* muscles, which pass from one part of the tongue to another, constitute its chief bulk, and move it on itself. These intrinsic muscular fibres run vertically, transversely and longitudinally, and are so interlaced as mutually to support one another, and to act with the greatest advantage. By the action of the various muscles, the upper surface of the tongue may be made concave or convex, or may be pressed against the roof of the mouth; the tip may be protruded straight out or laterally, upward and downward, and to any recess (as for instance, a hollow tooth) within the mouth where food might lodge; and the whole organ may be drawn back. The organ is freely supplied with blood, mainly by the lingual artery, which is given off by the external carotid. With regard to the nerves, the glosso-pharyngeal and certain branches of the third division of the fifth nerve are concerned in the special sense of taste (q.v.); other branches of the fifth nerve are concerned in ordinary sensation, while the hypoglossal nerve on each side is the motor nerve of the tongue.

The various uses or functions of the tongue cannot be thoroughly understood without a brief reference to its comparative anatomy. The tongue in mammals does not differ very materially from that of man; but in general there is a close coincidence both in size and form between this organ and the lower jaw. In the rodents the tongue has a wedge like shape. In the giraffe and the ant-eater, the tongue is much prolonged, being an important prehensile organ in the former; while in the latter it is driven into ant hills, and the victim is secured by its viscid secretion. In the feline races the conical papillæ are converted into recurved spines of great size and strength, which the animal uses in scraping bones and in combing its fur. Except in mammals, the tongue is probably not an organ of taste. For a good description of the tongue in birds, reptiles, and fishes, the reader is referred to prof. Owen's *Anatomy of the Vertebrates*, vols. i. and ii. Among the mollusca, the gasteropoda are provided with a very singular apparatus known as the tongue, and consisting generally of a thin membrane, long and narrow, and rolled, except at its anterior extremity, into a tube. This membrane is covered on its upper surface with transverse rows of minute teeth, or more commonly with plates having tooth-like siliceous projections. These teeth present a great variety of patterns, which are constant in the different genera, and even characterize the species. Two eminent naturalists, Messrs. Loven, a Swede, and Troschel, a German, have independently made the teeth of the mollusca a basis of classification. The *articulata* do not present anything like a true tongue, although in insects a certain oval appendage is described as a *lingua*.

The functions of the tongue are gustation, prehension (in man and monkeys this function is supplied by the hand), mastication, insalivation, deglutition, and speech; to

which may be added spitting and whistling, and in the case of the gasteropoda, trituration of the food.

Among the diseases of the tongue may be mentioned INFLAMMATION or GLOSSITIS. The most marked characteristics of this affection are great swelling, tenderness, and difficulty in speaking and swallowing. It rarely occurs as an idiopathic or spontaneous affection, but often accompanies severe salivation. It must be treated by purgatives and low diet, and by gargling as in ordinary salivation (q. v.). Incisions are sometimes useful, both to relieve tension, and by the depletion that ensues. Cases occasionally occur in which the tongue suddenly enlarges to an immense size, so as almost to cause suffocation, without any true sign of inflammation.—See Druitt's *Surgeon's Vade-mecum*, 8th ed., p. 454, foot-note.

Hypertrophy, or *persistent enlargement* of the tongue, sometimes results from an imperfectly cured case of inflammation; but is probably in most cases congenital, although perhaps not noticed for a year or two. Bertholin (*Hist. Centur.*, iii, p. 85) mentions the case of a male child born with the tongue protruding out of the mouth as large as a rabbit; and as the child grew, the tongue increased to the size of a calf's heart. For a reference to various cases, and for the mode of treatment, we may refer to a memoir by Dr. Humphry in vol. 36 of the *Medico-Chir. Transactions*. One of the most common forms of disease of the tongue is *ulceration*, which may arise (1) from the irritation of a decayed tooth with a sharp jagged edge; or (2) from constitutional syphilis; or (3) from a disordered condition of the digestive organs. In the first case the tooth must be removed; in the second, iodide of potassium with sarsaparilla should be tried; and in the third, the complaint generally yields to regulation of the diet and of the digestive organs, and sedatives at bed-time. M. Lawrance recommends a mixture of compound decoction of sarsaparilla with compound decoction of aloes, three times a day, and four grains of extract of hyoseyamus at bed-time, with advantage. *Cancer* of the tongue occurs either in the hard or in the epithelial variety. There is a popular belief that this terrible disease may be excited by the irritation caused by a broken tooth, or by smoking a clay pipe; but on comparing the prodigious numbers of jagged teeth and of clay pipes with the rare cases of cancer of the tongue, we must at once reject this hypothesis. All that such sources of irritation can effect is to determine the exact seat of development of cancer in persons predisposed to it. A typical case of epithelial cancer of the tongue occurred in the person of prof. Reid of St. Andrews, the eminent physiologist. In Dec., 1847, his age being then 39, and his health good, he noticed a small ulcer on the right side of his tongue; it slowly extended, and acquired hard everted edges, but caused little inconvenience. In July, 1848, it had attained the size of a five-shilling piece; its surface and edges were ragged, and it caused considerable pain, especially at night. A hard ridge could be felt all round the ulcer, and the glands beneath the jaw became enlarged. The health by the end of August had completely given way from the pain, when the diseased part of the tongue was removed by the late sir William Fergusson. In less than a month the wound had healed, and the health was re-established. In November the enlarged glands were removed, but the disease returned in their scars, and spread till it caused death in July, 1849. The only treatment which can be adopted with any chance of success is full and early extirpation. Prof. Syme succeeded in removing the whole organ, without even—strange to say—much affecting the patient's speech or power of deglutition. *Tongue-tie* is an affection for which infants are often brought to the surgeon, and which is often operated on when this might be dispensed with. The division of the *frenum* with a blunt-pointed pair of scissors, with their point directed downward, is very easily performed, and fortunately does no harm to the child. Children who do not speak so soon or so clearly as is expected by their mothers, are always supposed to have tongue-tie.

TONGUES, GIFT or, a gift of the apostles and other Christians in the first ages of the church. The main passages in the New Testament relating to it are Acts ii. 3-21; 1 Corinthians xii. 10, 28; xiii. 1, and particularly xiv. Allusions to it will also be found in Mark xvi. 17; Acts x. 46, and xix. 6. The only allusion to the possession of the gift in later times is in Irenæus, *Adv. Hær.* vi. 6: "We have many brethren in the church having prophetic gifts, and by the Spirit speaking in all kinds of languages." From these data, the following conclusions have been drawn by one of the most recent and intelligent expositors of the epistles to the Corinthians. The gift in question is represented as something entirely new in the apostolic age: "They shall speak with new tongues," Mark xvi. 17. The effect on the spectators at the day of Pentecost is of universal astonishment. It is represented as a special mark of conversion, immediately preceding or following baptism. It is a gift "of the Spirit." "They began to speak with other tongues, as the Spirit gave them utterance"—Acts ii. 4. It was, moreover, closely connected with the gift of "prophesying"—1 Corinthians xii. 10, 28; xiv. 1-6. It appears to be distinguished from prophesying by consisting not of direct warning, exhortation, or prediction, but of thanksgiving, praise, prayer, singing, and other expressions of devotion. It was an utterance of the heart and feelings, rather than of the understanding, so that the actual words and meaning were generally unintelligible to the bystanders, and sometimes to the speakers themselves: "He that speaketh with a tongue speaketh *not to men but to God*; for no one heareth; and in the

Spirit he speaketh mysteries"—1 Corinthians xiv. 2, 4, etc. So far, the account of the gift seems intelligible. It was, as Dean Stanley says, "a trance or ecstasy, which in moments of great religious fervor, especially at the moment of conversion, seized the early believers; and this fervor vented itself in expressions of thanksgiving, in fragments of psalmody or hymnody, and prayer, which to the speaker himself conveyed an irresistible sense of communion with God; and to the bystanders, an impression of some extraordinary manifestation of power, but not necessarily any instruction or teaching, and sometimes even having the appearance of wild excitement, like that of madness or intoxication." The special difficulty, however, remains, viz., as to the character of intelligibility which, on one prominent occasion, seems to have belonged to the gift. *Glossa*, or the word translated "tongue," does not necessarily imply a distinct language of a people; this is usually expressed in the New Testament by *dialektois*. But in the description in the Acts ii. 6, 8, it is expressly said: "Every man heard them in his *own language*" (*τῇ ἰδίᾳ διαλέκτῳ*). "How hear we every man in *his own language*" (the same phrase in the original) "wherein we were born." The plain meaning of this account seems to be, that the gift of tongues, on this occasion, at any rate, assumed the form of intelligible communications in foreign languages. But there is no evidence that the apostles then, or at any subsequent time, enjoyed the ability, supernaturally imparted, of speaking a variety of languages, with a view to the more adequate discharge of their apostolic functions, as has sometimes been inferred from the passage in the Acts. "Probably," it has been said, "in no age of the world has such a gift been less needed. The chief sphere of the apostles must have been within the Roman empire, and within that sphere, Greek or Latin, but especially Greek, must have been everywhere understood. Even on the day of Pentecost, the speech of Peter, by which the first great conversion was effected, seems to have been in Greek, which probably all the nations assembled would sufficiently understand; and the speaking of foreign dialects is nowhere alluded to by him as any part of the event which he is vindicating and describing."—Dean Stanley (*Corinth.* p. 250).

TONIC, or **KEYNOTE**, in music, the note which forms the basis of any scale or key and on which a piece of music written in that key naturally closes. See **KEY**.

TONICITY, **MUSCULAR**. The contractility of muscles shows itself under two distinct forms—*irritability* and *tonicity*, which are alike distinct in the mode of their action and in the conditions requisite for their exhibition. Irritability is most manifest in the voluntary muscles and in the heart, which, when in activity, exhibit powerful contractions alternating with relaxation; while *tonicity* is shown in a moderate and permanent contraction, which, instead of being consequent upon stimulation through the nerves, as in irritability, is especially excited by change of temperature in the tissue itself, and is mainly shown in the involuntary or non-striated muscles. Like irritability, it is an inherent property of muscular tissue during life. "It manifests itself," says Dr. Carpenter, "in the retraction which takes place in the ends of a living muscle when it is divided (as is seen in amputation); this retraction being permanent, and greater than that of a dead muscle. But its effects are much more remarkable in the non-striated form of muscular fiber; and are particularly evident in the contractile coat of the arteries, causing the almost entire obliteration of their tubes, when they are no longer distended with blood." It is to the moderate action of the *tonicity* of arteries that their contraction upon the current of blood passing through them is due. If the *tonicity* be excessive, the pulse is hard and wiry; but if it be deficient, the pulse is very compressible, though bounding, and the flow of blood is retarded. From the experiments of John Hunter and many subsequent physiologists, it is established that *cold* is the most efficient agent in inducing tonic contraction; while the application of moderate warmth causes a relaxation of this contraction. Thus, cold and heat are of extreme value as remedial agents, when the *tonicity* of the blood-vessels is deficient or excessive.

TONICS are medicines which, in cases of want of *tone* or *tonicity* in the muscular fibers, are employed to restore strength and vigor to the system. Tonics, to a certain degree, are stimulants; but while the latter produce a rapid but transitory excitement, the former slowly induce a certain degree of excitement, and the effect is permanent. Most, tonics, in which category we must place the shower-bath, cold sea-bathing, open-air exercise, friction, etc., as well as actual medicines of this class, act primarily through the nervous system (iron being, perhaps, the only exception); and secondarily produce their effects upon the muscular system at large. It is not only in general muscular debility that tonics are to be employed, but in all the numerous complaints which follow in its train, as palpitation, convulsions, epilepsy, chorea, neuralgia, and all forms of periodic disease. Among the chief medicines of this class are the dilute hydrochloric, nitric, nitro hydrochloric, and phosphoric acids, various salts of bismuth, copper, iron, silver, and zinc, the various kinds of cinchona bark, with their alkaloids and their salts, cusparia, calumba, cascarilla, chiretta, gentian, quassia, salix, simaruba, and taraxacum. Although *nux vomica* and its alkaloid strychnine are placed by writers on materia medica among the "special stimulants," when given in very small doses they have a well-marked tonic action; and there is probably no tonic medicine of more general utility than the *syrup of iron, quinine, and strychnine*, a non-official but widely-used preparation, of which every dram (the ordinary dose) contains $\frac{2}{5}$ of a grain of strychnine.

TONIC SOLFA. Various attempts have been made at different times to introduce a musical notation in which the staff with its lines and spaces is dispensed with. Jean Jacques Rousseau suggested, but afterward discarded, a notation where the notes of the scale were indicated by the Arabic numerals. A system similar to Rousseau's in its leading features, called the tonic solfa, has, through the influence of its principal promoter, the rev. John Curwen (who obtained his main principles from the writings and practice of Miss Glover of Norwich), been brought into use to a considerable extent in singing schools in this country. It proceeds on the principle of giving the chief prominence to the fact, that there is in reality but one scale in music, which is raised or lowered according to the pitch of the key. The seven notes of the diatonic scale are represented by the solfeggio (q.v.) syllables, or rather Miss Glover's modification of them—*doh, ray, me, fah, soh, lah, te*; *doh* standing for the key-note in whatever key the music is written. In the early exercises, the pupils are accustomed to a scale or diagram, called the modulator, representing pictorially the exact intervals of a key, with the semitones in their proper places. In written music, only the initial letters of the solfeggio syllables are used—*d, r, m, f, s, l, t*; the higher octaves of a given note being distinguished by a ¹ above, as *d¹, r¹*; and the lower by a ₁ or ₂ below, *m₁, m₂*. The name of the key is prefixed to a tune as its signature, as "Key A," "Key B flat"—the key-note being, in all the major

keys, *doh*. To indicate rhythm, a perpendicular line | precedes the stronger or louder accent, a colon : the softer accent, and where necessary, a shorter perpendicular line | the accent of medium force. Preparatory to writing the notes, the accent-marks are placed at equal distances along the page—thus, | : | : or : | : : | : : | :

or | : | : | : | : A note immediately following an accent-mark, is supposed to occupy the time from that accent to the next—

thus, | *d : d : d* | *d : d : d* | *d*, or | *d : r* | *m : d*. A horizontal line indicates the continuance of the previous note through another *aliquot* (the term used by Mr. Curwen for the distance of time between any accent and the next)—thus, *d :—* | *d : d*. A dot

divides an aliquot into equal subdivisions, *d : m.r* | *d*. A dot after a mark of continuance indicates that the previous note is to be continued through half that aliquot—thus, *d :—f* | *m : d*. A comma indicates

that the note preceding it fills a quarter of the time from one accent to the next—thus, | *d : r.m,f* | ; a dot and comma together, three-quarters—thus, | *f,m : r.,d*. An inverted comma , is used to denote that the note preceding it fills one-third of the time from one accent to the next—thus, : *d* | *s : l.s,f* | *m : r* | *d*. An

aliquot or part of it unfilled, indicates a rest or pause of the voice. A line below two or more notes signifies that they are to be sung to the same syllable. We subjoin an example of the tonic solfa shown alongside of the ordinary notation:

KEY A. GOD SAVE THE QUEEN.

| *d : d : r* | *t₁ :—d : r* | *m : m : f* | *m :—r : d* | *r : d : t₁* | *d :—* | *s : s : s*

| *s :—f : m* | *f : f : f* | *f :—m : r* | *m : f.m : r.d* | *m :—f : s* | *l₃ s.f : m : r* | *d :—* ||

f¹
m¹
r¹
d¹
te
ta
lah
se
soh
f^o
fah
me
ray
doh
t₁
l₁
s₁
f₁
m₁

Modulator.

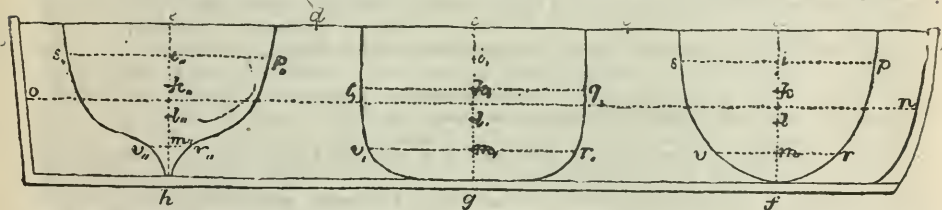
In modulating into a new key, the note from which the transition is taken is indicated by a combination of the syllabic name which it has in the old key with that which it has in the new—*me lah*, for example, being conjoined into *m'lah*; and in writing this note, the initial letter of its syllable, as a member of the old key, is placed in small size before and above the initial of the syllable of the new, as ^ml, ^ds. In the case, however, of an accidental, where the transition is but momentary, a sharpened note changes its syllabic vowel into *e*, and a flattened note into *aw*, spelled *a*, as *fah*, *fe*; *soh*, *se*; *te*, *ta*. In the minor mode *lah* is the key-note; the sharp sixth is called *bah*, and the sharp seventh *se*. The signature of the key of A minor is "Key C, minor mode."

For a full explanation of this system see Curwen's *Grammar of Vocal Music*, or the periodical called the *Solfa Reporter*. The advocates of this notation maintain that it possesses advantages over the common system, particularly from the distinctness with which it indicates the key-note and the position of the semitones; the cheapness with which it is printed; and the manner in which, they say, it develops the proper mental effects of notes in key-relationship, and employs them in teaching. It has, however, been objected to by others, from its withdrawal of the direct indication of pitch to the eye, which exists in the common notation, from its limited applicability to instrumental music, and from its acquirement not being, like that of the ordinary notation, an introduction to the world of musical literature.

TONKA BEAN, or **TONGA BEAN**, the seed of *dipteryx odorata*, a large tree, of the natural order *leguminosæ*, sub-order *papilionaceæ*, a native of Guiana, having pinnated leaves and axillary racemes of purplish flowers. The fruit is an oblong, dry, fibrous drupe, containing a single seed, which has a strong agreeable odor, owing to the comarin (q.v.) which it contains, and which is sometimes found crystallized between the cotyledons. Tonka beans are used for flavoring snuff, for which purpose one is carried in the snuff-box; and are put among clothes to preserve them from insects, and to communicate an agreeable odor.

TONKIN, or **TONQUIN**. See **COCHIN-CHINA**, *ante*.

TONNAGE, in regard to ships, is the measure of capacity, the ton being one not of weight, but of cubic content—i.e., 40 cubic feet. Very early in the history of navigation, some scale must have been established by which the relative capacity of different vessels could be determined. In England there are early laws upon the subject, settling the data upon which the calculation should be made. The present system, called "new measurement," dates from 1835; but the prior system, established in 1719, and now known as O. M. (old measurement), still subsists among yachts and some other vessels. The old measurement was greatly erroneous, for the actual depth of the ship was



not taken into account, but was assumed to be equal to her breadth. The tonnage was then obtained by multiplying together length, breadth, and assumed depth in feet, and by dividing the product by 94. As harbor dues and such like taxes were levied according to each vessel's tonnage, it naturally followed under such a system that traders built their ships with as little beam and as great depth as they possibly could. The ships thus became highly dangerous in rough weather, and, moreover, every principle of correct naval architecture was set at naught, to produce deep wooden boxes capable of carrying a maximum of cargo with a minimum of beam. The absurdity of a law by which, in consequence of an inch more beam, a two-decked vessel might appear of greater capacity than a three-decked ship of like length, was so palpable, that many efforts were made at improvement, though without success until 1835.

By the act of that year, the new system established the depth of hold as a necessary ingredient of the calculation. As, however, the section crosswise of a ship varies so considerably at different points in her keel both in superficies and shape, more than an approximation to her cubic content cannot be attained. To arrive at this approximation, the total length of the upper deck, or, if the ship be not wholly devoted to cargo, of the upper portion of the space for cargo, is taken, and divided into 6 equal parts at the points, *a*, *b*, *c*, *d*, *e*. From the foremost, center, and aftmost of these points, the depths to the bottom of the hold are measured as *af*, *cg*, *eh*. Each depth has to be divided into 5 equal parts; at the fore and after depth, the width inboard of the ship is measured at $\frac{1}{5}$ and $\frac{4}{5}$ the depth from the top; and the center-depth at $\frac{2}{5}$ and $\frac{3}{5}$ from the top. These lateral measurements at *i*, *j*, *k*, *m*, *n*, and *m*, are developed on the plan, and curves drawn representing cross-sections of the ship at the given points. All dimensions are supposed to have been taken in feet and decimal parts, and they are thus used in

computing the tonnage. The "length," *no*, is measured from stem (internal side) to stern post, at half the height of the center-depth from the keel. To twice the depth amidships (*cg*), add the depths forward and aft (*af*, *eh*). The result is the "sum of the depths." Add together the two breadths taken at the foremost depth: of the breadths taken at the center-depth (*cg*), add together three times the breadth at $\frac{2}{3}$, and twice the breadth at $\frac{1}{3}$; of the after-breadths, add together the breadth at $\frac{1}{2}$, and twice the breadth at $\frac{3}{4}$. The sum of these three totals is the "sum of the breadths." Having obtained these quantities, the tonnage is approximated to in a somewhat arbitrary manner by the following formula:

$$\text{Tonnage} = \frac{\text{Sum of depths} \times \text{sum of breadths} \times \text{length}}{3500};$$

or, if expressed in terms of the figure:

$$\text{Tonnage} = \frac{\{2cg + af + eh\} \{ (ps + rv) + (3tq + 2r.v.) + (p_s.s. + 2r.v_s) \} \times no}{3500}$$

In computing the measurement of a steamer, the same system is followed, but the tonnage of the engine-room (which is supposed to be capable of floating engines and boilers) is deducted from the total to express the tonnage of the ship.

TONNAGE (more properly **TUNNAGE**) and **POUNDAGE**, certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward III. They were at first granted to the crown by the vote of parliament for a limited number of years, and renewed on their expiry. The object of these imposts was said to be that the king might have ready money in case of a sudden emergency demanding it for the defense of the realm and the guarding of the sea. Originally fluctuating in amount, tonnage and poundage came to be fixed at 3s. on every tun of wine, and 5 per cent on all goods imported. In the reign of Henry V. they were first conferred on the king for life; and the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of parliament as but a formality expressive of the popular recognition of his prerogative. Though these duties were not voted to Henry VIII. until the sixth year of his reign, he, notwithstanding, levied them from the date of his accession; and parliament in voting them took occasion to blame those merchants who had neglected to make payment. It was, in fact, usual to levy these duties during the period intervening between a sovereign's accession and his first parliament, and this was done by Charles I. as by his predecessors. The commons, however, in Charles's first parliament accorded these imposts not for life, but for a year only; and the house of lords objecting to this departure from previous usages, and rejecting the bill, tonnage and poundage were attempted to be levied by the royal authority alone, a proceeding which raised the opposition of the commons. Charles was, in 1629, induced to pass an act renouncing the power of levying these or any other imposts without parliamentary sanction. On the restoration, Charles II. obtained a grant of tonnage and poundage for life; and the same course was followed on the accession of James II. and of William III.; but by three several statutes of Anne and George I. (9 Anne, c. 6; 1 Geo. I. c. 12, and 3 Geo. I. c. 7) these imposts were made perpetual and mortgaged for the public debt. The customs consolidation act, introduced by Mr. Pitt in 1787, 27 Geo. III. c. 13, swept away tonnage and poundage, and all the other then existing changes, and substituted a new and single duty on each article. See **CUSTOMS DUTIES**.

TONNEAU. See **METRIC SYSTEM**.

TONQUIN, the most northerly province of Cochin China (q.v.).

TONQUIN, GULF OF, an arm of the China sea, bounded by Cochin China on the w., by China on the n., and by the Chinese province of Quang-tung and the island of Hainan on the east. It is 150 m. in width, and 300 m. in length. The Song-ca and many other rivers fall into the gulf, and along the coasts are many islands, chiefly, however, small. Extensive fisheries are carried on on the coast; and the fish, besides being largely sold in the interior of the province of Tonquin, are exported in great quantities to China.

TONSILITIS. See **QUINSY**, *ante*.

TONSILS. See **PALATE**.

TONSURE (Lat. *tonsura*, a shaving, from *tondeo*, I shave), a religious observance of the Roman Catholic and oriental churches, which consists in shaving or cutting the hair as a sign of the dedication of the person to the special service of God and commonly to the public ministry of religion. It is a very ancient usage, and by some writers is represented as of apostolic origin; but that it did not prevail in the early ages is sufficiently plain from the fact with which Optatus upbraids the Donatists of his time (4th c.) of having shaved the heads of certain Catholic priests and bishops in derision. Jerome also in his *Commentary on Ezekiel*, c. 24, is equally explicit. It would appear that the usage first arose in reference to the monastic rather than the clerical life. Paulinus of Nola, in the end of the 4th or beginning of the 5th c., alludes to it as then in use among the western monks; and it speedily passed from them to the clergy, the crown-like

figure being regarded partly as a symbol of our Lord's crown of thorns, partly as an emblem of the "royal priesthood" of the Christian dispensation. The form of the tonsure was different in different churches, and the varieties of it are of some historical interest. That of the Roman church, called "the tonsure of Peter," consisted in shaving the crown as well as the back of the head, so that there remained a circular ring or "crown" of hair. This was the form in use in Italy, Gaul, and Spain. In the "Scottish (or Irish) tonsure," which was in use in Ireland, in north Britain, and in those parts of Germany in which the Irish missionaries had preached, the entire front of the head was shaved, leaving the front bare as far back as the line from ear to ear. This tonsure was called "the tonsure of James," and sometimes of "Simon the magician." The Greeks and other orientals shaved the *entire head*. The supposed derivation of the Irish form of tonsure from the apostolic times led to its being held both in Ireland and in Britain, as well as other churches of Irish foundation, to be of the most vital importance, inasmuch that the introduction of the Roman form was almost the occasion of a schism. Originally the tonsure was merely a part of the ceremonial of initiation in orders, and was only performed in the act of administering the higher order; but about the 7th c. it came to be used as a distinct and independent ceremonial, and a question has been raised whether it is to be considered as itself an order and to be added to the list of what are called the "minor orders" (q.v.). The now received opinion of Catholic writers is that tonsure is not an "order," but only a "preparation for orders."—See Wetzer and Welte's *Kirchen-lezicon*, art. "Tonsur."

TONTINE. This term is derived from the name of Tonti, a Neapolitan, who seems to have been the first propounder of a scheme for a financial association of which the prize or prizes were to accrue to the longest liver or livers. Generally, in an association on what is called the tontine principle, a payment is made by each member of the association, and with the capital so formed, an annuity, payable at the same rate until all the lives forming the association are extinct, is bought from some company or individual. This annuity is divided among the members according to age and premium paid by each; and on the decease of any member, the surplus thence arising is divided among the survivors; and on the death of the last member of the association, the total annuity reverts to the source from which it has hitherto emanated. There are, however, various kinds of tontines; and the designation of tontine may, with propriety, be applied to any financial scheme by which it is proposed that gain shall accrue to survivorship. In England, tontines have rarely been resorted to as measures of public finance. The last for which the government opened subscriptions was in 1789.—See Hamilton's *History of Public Revenue*, p. 210. Schemes on the tontine principle seem generally to be acceptable to the public, owing, probably, to the sort of sentimental faith which most persons have in their own prospects of longevity, and to the prudent desire for ease and affluence in old age. The application of the principle by life assurance companies in their mode of distributing "bonus," or surplus profits, has long been a subject of controversy among these valuable institutions. It would be impossible here to go into the argument with any degree of nicety. It may, however, be broadly stated as follows: A company formed for the purpose of life assurance means a company in which the members who are lucky in having long life are to pay for those who are unlucky in dying prematurely. But over and above the net mathematical premium payable by each member of an assurance society, or by each person assured at the risk of a company, a percentage, or "loading," as it is technically called, is added, to cover expenses of management and other contingencies. Where the funds of the company or society have been invested with average success, the loading is generally found, at the periodical actuarial investigations, to have been in excess of actual requirements; and the question then arises, How are "profits," or, in other words, the overcharges on premiums, to be divided? The question is plainly one of great intricacy. The argument used by the offices favoring the younger policy-holders is, that those which favor the older are really acting on a tontine principle, which is the very converse of what ought to prevail in life assurance; on the other hand, it is said that the fulfillment of the insurance contract is provided for by the net premium, and that the distribution of over-payments, as "profits" really are, is to be determined on principles wholly independent of insurance. See "Notes on the Early History of Tontines," by J. Hendricks, in the *Assurance Magazine* for July, 1862.

TONTY, HENRY DE, Chevalier, 1650-1704; b. France; served in the French army and navy. He came to Canada with La Salle in 1678, and accompanied him in his exploration of the Mississippi. He endeavored to establish a colony in Arkansas, went down the Mississippi twice to find La Salle and again to meet Iberville, and died at what is now Mobile.

TOOELE, a co. in w. Utah, adjoining Nevada; bounded n.e. by the Great Salt lake; 8,320 sq.m.; pop. '80, 4,497—3,196 of American birth. The surface is part of the great Salt lake desert and the soil is sandy and unproductive; wheat, corn, and oats are raised in small quantities. Co. seat, Tooele.

TOOKE, JOHN HORNE, a celebrated etymologist and political adventurer, was the son of John Horne, a London poulterer, and was b. in that city, June, 1736. He was educated first at Westminster and Eton, and afterward at St. John's college, Cambridge, where he took the degree of B.A. in 1758. After spending some time as an usher in a

school at Blackheath, he entered the church (to please his father, and strongly against his own wish), and in 1760 became curate at New Brentford. The disgust he entertained for the sacred profession led him to indulge (by way of revenge) in a license of speech and life, which appears to us to have fatally affected the honesty of his character. It is impossible, for instance, to read a passage like the following (from one of his letters to Wilkes), without feeling a deep distrust of the whole man: "It is true I have suffered the infectious hand of a bishop to be waved over me; whose imposition, like the sop given to Judas, is only a signal for the devil to enter; but I hope I have escaped the contagion; and if I have not, if you should at any time discover the *black* spot under the tongue, pray kindly assist me to conquer the prejudices of education and profession." When Wilkes (whose acquaintance he had made during a trip to Paris) stood as a candidate for the county of Middlesex, Tooke zealously aided him, pledging his credit for Wilkes's expenses, and declaring that, "in a cause so just and holy, he would dye his black coat red;" but he afterward quarreled with his dubious associate, and in 1770-71, the two had a rasping epistolary controversy, which appears to have hugely gratified their enemies. He still, however, continued to meddle in political affairs, and even ventured to encounter (not without success) the formidable Junius. In 1773 he resigned his living at New Brentford, and commenced the study of law, a profession in which he was really fitted by nature to excel. About this time, he rendered some important private service to a Mr. Tooke of Purley in Surrey, who designed to make him his heir, but altered his mind, and only left him a legacy of £500. Altogether, however, he is said to have received from this gentleman about £8,000, and, in consequence, adopted the surname of Tooke, by which he is now known. In 1775 he was fined and imprisoned in the King's Bench for publishing an advertisement in which he accused the king's troops of barbarously murdering the Americans at Lexington. While in prison, he penned his celebrated *Letter to Mr. Dunning*, in which are to be found the germs of his *Diversions of Purley*. It excited a good deal of attention at the time, and even Dr. Johnson, who detested Tooke's political sentiments, expressed his intention—should he publish a new edition of his *Dictionary*—to adopt several of the "dog's" etymologies. On his release from confinement, Tooke made an attempt to gain admission to the bar, but was refused, on the ground of his clerical orders. Soon after, he reverted to political writing, at once the pleasure and the poison of his life, and in a *Letter on Parliamentary Reform*, advocated universal suffrage. In the struggle between Pitt and Fox, he pamphleteered on the side of the former, but soon got to hate Pitt too, as he had learned to hate most other public men. In 1783 appeared his famous *Epea Pteroenta, or the Diversions of Purley*, a work on the analysis and etymology of English words, which, amid much that is erroneous, both in principle and detail, contains still more that is acute, original, and true. In particular, he has demonstrated, says a *Quarterly Reviewer* (No. 14), that "all words, even those that are expressions of the nicest operations of our minds, were originally borrowed from the objects of external perception." See PHRLOGY. But Tooke's passion for politics soon drew him from the calm pursuit of literature into the vortex of public life. In 1790 and again in 1796 he stood as a candidate for Westminster, but was unsuccessful on both occasions. At length, in 1801, the great enemy of rotten boroughs entered parliament for the most notorious rotten borough in England—Old Sarum; but he made no figure there. He died at Wimbledon, Mar. 19, 1812. Tooke was never married, but had several natural children, to whom he left his property. The best edition of the *Diversions of Purley* is that of Taylor (Lond. 1840).

TOOKE, THOMAS, 1774-1858; b. St. Petersburg; an English merchant in the Russian trade. He devoted himself to the study of economic laws, and published in 1823 *Thoughts and Details on High and Low Prices*. His chief work is his *History of Prices*, 6 vols. (1833-57), upon the last 2 vols. of which he was assisted by his pupil Newmarch. He was the founder in 1831 of the political economy club.

TOOMBS, ROBERT, b. Washington, Ga., 1810; graduated at Union college, 1828; studied law at the university of Virginia, and began practice in Wilkes co., Ga. In the Creek war of 1833 he served as capt. of the volunteers. From 1837 to 1845, he was a member of the state legislature; in 1845 he was elected to congress and held his seat for four terms, or until 1853, when he was elected to the U.S. senate, and in 1859 re-elected. In politics Toombs was then, and is now (1881), an extreme Jeffersonian democrat, believing fully in states-sovereignty, the right of secession and the propriety of slavery. It should be added, however, that in 1840 and 1844 he supported Harrison and Clay with the old line whigs. As an impassionate political speaker he has few equals. The movement of secession had his full approval; and his influence, more than other's, led his state to pass the ordinance of secession, to which there was a strong opposition, especially among the "old line whigs." He was the choice of a great part, perhaps the majority, of southern voters for president of the new confederacy. On the election of Davis, Toombs was offered the office of secretary of state and with reluctance accepted it for a short time, on his resignation receiving a commission as brig.gen.; he served at Manassas and Sharpsburg, and in 1863 was made brig.gen. of the Georgia militia. After the war he lived for some time abroad, and since 1867 he has carried on a successful law practice at his old home. He is noted for his brilliant wit, his legal sagacity and his benevolence.

He was a bitter opponent of the "reconstruction" measures, and has never taken the oath of allegiance.

TOOMBUDRA (correctly **TUNGA-BHADRO**), an important tributary of the Kistnah or Krishna, rises in the s.w. of Malsur (Mysore), and after a n.e. course of from 350 to 400 m., joins the Kistnah, 25 m. below Karnul.

TOON, or **TOONA**, *Cedrela toona*, a tree of the natural order *cedrelaceæ*, one of the largest timber trees of India. Dr. Hooker mentions one which he measured which was 30 ft. in girth at 5 ft. above the ground. The leaves are pinnate, the flowers small, in panicles, with a honey-like smell, the petals erect, and approaching each other so as to form a sort of tube. The tree ascends to the height of 4,000 ft. on the Himalaya mountains, and is found to the furthest s. of the East Indies. It is sometimes called *bastard cedar*. The wood is soft, but is used for furniture. The bark is a powerful astringent, and is used in dysentery, diarrhea, etc.

TOORKISTAN, or **TURKESTAN**. See **TURKISTAN**, *ante*.

TOOTHACHE. See **TEETH**.

TOOTHACHE-TREE. See **ARALIA** and **XANTHOXYLUM**.

TOOTH-ORNAMENT, much used in the early English style.

TOP, in a ship, is the platform at the head of each lower-mast. It is supported on the restle-trees and cross-trees, and serves to give a wider base to the top-mast shrouds. It is also used for working the upper sails. In a well-ordered ship, there is a captain and crew for each top. Formerly, in vessels of war, the top was fortified with hammocks all round, and in action was made to do duty as a sort of redoubt, whence a fire of small-arms, or even light swivel-guns, was poured upon the deck of the enemy.

TOPAZ, a mineral, ranked by mineralogists among gems (q. v.), and the finer varieties of which are much valued both for their luster and the beauty of their colors. It is composed chiefly of alumina and silica, the former, in general, more than 50 per cent of the whole, with fluoric acid, and usually a little oxide of iron. It is found generally in primitive rocks, and in many parts of the world. A crystal 19 ounces in weight was found in the Cairngorm mountains in Aberdeenshire, Scotland; and fine topazes are sometimes found in that part of Scotland, in Cornwall, and in the Mourne mountains in Ireland. Five topazes are found in Ceylon, but those most prized by jewelers are generally from Brazil. The finer varieties of topaz are in general found either crystallized, or as small rolled masses, which may have been formed from crystals, in alluvial soil. Topaz is either colorless, or red, blue, green, or yellow, in great variety of shades. Its crystals are rhombic prisms, generally terminated by four-sided pyramids, but often variously bevelled and acuminate. The prisms are finely striated. The cleavage parallel to the base of the prism is easy. The specific gravity is about 3.5. The luster is vitreous. Topaz is translucent or almost transparent on the edges. It is harder than quartz. It is rendered very electric by heat or friction, and by this property a topaz may at once be distinguished from a diamond or ruby, for which otherwise, when cut and set, it might readily be mistaken. A coarse variety of topaz, called *pyrophyllite*, occurs near Fahlun, in Sweden, which is not crystallized. It is greenish white. When reduced to powder, it can be used as emery for grinding and polishing. —Topaz derives its name from the *topazion* of the ancients, which, however, seems to have been a totally different mineral.

TOPE, *Galeus canis*, a small species of shark, of the family *galeidae*, which has two dorsal fins and one anal, spout-holes, and the eyes furnished with a nictitating membrane, the first dorsal situated over the space between the pectorals and ventrals. The tope is very abundant on the shores of the southern coasts of Britain, but becomes more rare toward the north. The name tope is said to be originally Cornish. Other local names are *millar's dog* and *penny dog*. It attains a length of about 6 feet. The tope is extremely troublesome to fishermen, robbing their lines of the fish which are attached to them, and biting off the hooks, or, if it happens to be itself hooked, often winding the line round its body in many coils and with tangled knots.

TOPE is the vernacular name of Buddhistic monuments intended for the preservation of relics. In Ceylon and elsewhere they are also called *dagops*; and another of their designations is *chaitya*. The difference between these terms results from their meaning. Tope is the Pāli *thāpa*, and the Sanskrit *stūpa*; it means, therefore, literally "accumulation," and conveys a sense analogous to that of the Latin *tumulus*. *Dagop* is a corruption of *dhātu-gopa*, i. e., relic-preserver; and *chaitya* applies generally to objects of worship, as images, temples, sacred trees, etc. *Tope* is, therefore, the name of those monuments in regard to their shape; *dagop*, in regard to their purpose; and *chaitya* the general term. Though the shape of the topes underwent many changes according to time and locality, it is possible to distinguish its oldest type from its later development. The oldest topes are in the shape of cupolas, generally spherical, but sometimes elliptical, resting on a cylindrical or quadrangular, or polygonal base, which rises either in a straight or inclined line, or in terraces. The top of the cupola, surrounded by a balcony of pillars of a peculiar kind, is crowned by a structure generally quadrangular, but sometimes in the shape of a reversed pyramid of a few steps; and over this structure is a roof in the shape

of an extended parasol (Sanskrit, *chhatra*; in Pāli, *chattha*). This was the form, for instance, of the topes of Sanchi, of the dagops of Ceylon, and the oldest monuments of this kind in the Punjab and Afghanistan; though in most of them the parasol, being of wood, is either completely destroyed, or merely recognizable in its fragmentary condition (see art. BUDDHISM, where, in the section of the cave temple at Karli, the tope is seen still surmounted by the wooden umbrella). The cupola was sometimes ornamented with more than one parasol; in some of the topes of Sanchi there are three, and even five parasols side by side, the middle one exceeding the rest in height. The different arrangement of these parasols, especially when their number increased, led to a different shape of the topes, such as occurs, for instance, in China and Thibet. This arrangement consists in placing them one *over* the other; and not only three or five, but even seven, nine, or more are so placed. The height of the structure thus became naturally greater than it originally was, and the topes, instead of having the character of cupolas, now assumed that of pyramids resting on a cupola base, the parasols gradually giving way to a real pyramidal form. In some monuments of this class, however, the cupola was placed above, when the base consists in round or quadrangular towers rising in a spiral form, or in several stories. The Chinese, on the contrary, rejected the cupola altogether, and merely retained the succession of parasols extended one over the other, converting them into a many-storied tower; and the same is the case with the topes of the Mongols, the *ssuvarghans*, which are pyramids erected on a low quadrangular base. The top of the pyramidal topes always carries some metal ornament, frequently gilt, resembling a parasol, or a needle, or a trident, or a rising flame. The height of these buildings varies from a few feet to 300, and even more; there are also topes of a few inches only, but they serve merely as ornaments in temples or buildings, or as symbols of the real topes. If erected in cave-temples the tope generally stands at the end of a long hall especially cut out for it, but sometimes also in the sanctuary of the cave-temple itself; if erected overground it stands always in the vicinity of a temple or convent. In the interior of the tope is the cell or chamber (*dhātugavāha*) where the box containing the relics and "the seven precious things" was placed. This cell consists of six slabs of stone, firmly closed after the box with the relics, etc., had been placed in it; and it was immured into the tope after its structure had, in the course of building, attained a certain height; the building then being brought to its completion, so that the cell enshrining the relic was inclosed on all sides with solid brickwork. The "seven precious things" referred to, with which the relics were ornamented, are differently enumerated; according to one account, they are gold, silver, lapis lazuli, crystal, red pearl, diamond, and coral; others mention ruby and emerald; and others, again, omit gold and silver. In several cells which have been opened the box contained, besides the relics, precious stones of various kinds, golden ornaments, and coins; and the box itself generally consisted of an outer casement of stone, clay, or bronze, which inclosed a silver cylinder, and within this a golden cylinder, which was the real receptacle of the relics. Both cylinders had generally a convex lid, representing the shape of the cupola, and the box exhibited inscriptions commemorating the name of the saint to whom the ashes or other relics contained in it had belonged. It seems that there are also topes which had the relics placed, not within, but under them—or, in other words, in the ground on which they were erected; for, in some which were opened, neither a cell nor any relic was found; and though it is possible that such monuments were merely erected in commemoration of some personage, there are, on the other hand, accounts which relate that relics were also placed under the dagops. Whether these accounts be correct it is at present impossible to say, as no foundation on which such dagops stand has as yet been explored. It has been supposed by some authors that the topes contained some secret passage leading to the relic-cell, known only to the priests or the initiated, who thus might gain access to the relics; for legends relate that during night such relics occasionally shed light, and that some pious king was deemed worthy of being favored with their sight; but none of the topes hitherto explored—and some of these are of the greatest dimensions—yielded any confirmation of this theory: they proved to be nothing but solid masses of brick and stone, without any chambers or passages—merely containing the relic-cell, of generally one foot in diameter. That the cupola of the topes was intended to represent the water-bubble, the Buddhistic symbol of the hollowness and perishability of the world is borne out by a legend in the *Mahāvamsā* (q.v.). The purport of the parasol may seem more doubtful; but as the parasol is the emblem of Hindu royalty, and as Śākyamuni, himself the son of a king, replied to the question how he wished to be buried, by answering: "Like an emperor," it is not unlikely that the parasol of the topes was intended to imply the royal dignity possessed by a Buddhistic saint. When the topes became pyramids or towers consisting of terraces and stories, the number of the latter had likewise a symbolical import. Thus, only the topes of the most accomplished Buddhas had thirteen terraces, to show that these Buddhas had passed beyond the twelve causes of existence; three terraces imply the three worlds—the world of desire, that of form, and that of absence of form; five, the five steps of Mount Meru; and so on.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin, 1857). vol. i. p. 533, ff., and the works quoted there.

TOPEKA, a city in Kansas, capital of the state, and of Shawnee co.; on both sides of the Kansas river, and on the Atchison, Topeka and Santa Fé, and the Kansas City.

Topeka and Western railroads, about 65 m. from Kansas city. Pop. '80, 15,457. It is regularly laid out with wide streets crossing each other at right angles. It has 7 newspapers, of which 3 are daily, a court house, and a fine state house. Among the educational institutions are Washburn college under Congregational control, having grounds of about 160 acres, a fine collegiate building, and an endowment fund of some \$100,000; the college of the sisters of Bethany, a Protestant Episcopal school for girls, having a costly school edifice, and said to be one of the best schools in the west; and a Roman Catholic seminary. The legislature, and the state and U. S. courts meet here. The state insane asylum for the insane is near. Among the manufactories are breweries, iron foundries, flour mills, a rolling mill, brick kilns, etc. The machine shops of the Atchison, Topeka and Santa Fé railroad are here. There is an iron bridge across the river. Topeka became a city in 1857, and the state capital in 1861.

TÖPFFER, RUDOLPHE, 1799-1846, b. Geneva; was first a landscape painter; was appointed professor of æsthetics at the academy of Geneva; and became a novelist. He published *Le presbytère* (1839); *La bibliothèque de mon oncle* (1843); *Rose et Gertrude* (1845); *Nouvelles Gênéroises*, (1845); and *Collection des Histoires en Estampes*.

TOP-GALLANT, in a ship, the name applied to the third mast or sail above the deck, i. e., to the mast and sail next above the topmast and topsail respectively.

TOPHANE (correctly, **TOP-HANEH**), a suburb of Constantinople, forms a continuation of Galata along the northern shore of the Bosphorus. See **CONSTANTINOPLE**.

TOPIET. See **GEHENNA**, *ante*.

TOPICS (the Gr. term *topike*, from *topos*, a place) was the name given by the Greek and Roman rhetoricians and grammarians to the art of discovering arguments. It consisted in the eliciting out of the series of particulars certain general conceptions and propositions, which, in the elaboration of oratorical discourses, served as guides in the invention and choice of suitable arguments. Any one such general conception was called in Greek *topos*; in Latin, *locus communis* (a "common place"). The Greeks bestowed much attention on this art; among the Romans, Cicero composed *Topica*, and various other treatises of a kindred nature. During the middle ages, it was proposed to apply it to the whole circle of human knowledge, and even to the solution of the most difficult intellectual problems; but, in general, these efforts only resulted in empty exhibitions of mental vivacity (*jeu d'esprit*); and in modern times, the so-called "art" has sunk so low that by the term "topic" one understands nothing more than a theme or subject for discussion and talk.

TOPKNOT, the popular name of some small fishes of the same genus with the turbot (q.v.) and brill. **MULLER'S TOPKNOT** (*Rhombus hirtus*) is not uncommon on some parts of the British coast, particularly the west coast of England. **BLOCH'S TOPKNOT** (*R. punctatus*) is more plentiful in northern parts. They are very similar, brown and mottled with very dark brown or black on the upper surface, white below. They live among rocks, where they are not easily distinguished by the eye from the sea-weed. Although very delicate fish, they are little regarded, the largest being seldom more than 7 or 8 inches in length. The breadth is about half the length.

TOP LITZ, or **TEPLITZ**, a watering-place of Bohemia, one of the most celebrated of the German spas, is pleasantly situated on the Saubach (Pig's stream), 16 m. n.w. of Leitmeritz. The chief building is the palace of prince Clary, to whom the town in great part belongs; and behind this building are a park and gardens, which are the principal places of resort. Within their limits are the theater and the Gartensaal, the latter of which serves the purposes of reading, dining, and ball room. On the hill behind the palace is the Schalckenburg, a sort of tavern, built in imitation of a castle, and which commands a wide view from its prospect tower. The baths are supplied from 11 hot alkalo-saline springs, the chief of which has a temperature of 120° Fahr. They are taken exceedingly hot, and have great virtue in restoring persons afflicted with gout, rheumatism, etc. Pop. of Toplitz, '69, 10,155. Between 7,000 and 8,000 strangers annually visit the baths.

TOPLADY, AUGUSTUS MONTAGUE, 1740-78; b. England; educated at Westminster school, and Trinity college, Dublin; was ordained, and preached in a chapel near Leicester fields, London, 1775. He was the great champion of Calvinism in the church of England, and wrote much against the Methodists with great vigor of language and argument, but often with undue asperity of style. He edited for several years the *Gospel Magazine*. His controversial works, mostly in reply to Wesley, are numerous. He published some popular hymns, one of which is *Rock of Ages, cleft for Me*.

TOPOGRAPHY is literally a description of places (Gr. *topos*, a place), as rivers, hills, woods, but more especially cities, roads, bridges, streets, and even particular buildings. It differs from ordinary geography only in being more special and minute. Thus we have topographical descriptions of counties, provinces, and kingdoms, excellent specimens of which are Lewis's *Topographical Dictionary of England*, and Murray's *Hand-books of English counties and continental kingdoms*.

TOPOGRAPHY, MILITARY. Among the first necessities of a military commander is a thorough knowledge of the physical conformation, the obstacles, and the resources of

the country in which he has to operate. It frequently happens that the field of warfare is one of which no careful survey is procurable. It devolves, then, on the officers of the staff to make their chief acquainted with all the particulars he requires; hence, topographical drawing is made a principal ingredient in the course of study at the staff college. These surveys devolve, in the field, on the quartermaster-general's department. An officer of this service is expected to traverse a country with rapidity, to measure distances by eye or intuition, to note them roughly down as he rides, to obtain a rough knowledge of hills and valleys, of roads and ravines, rivers and the means of crossing them. He must at the same time make himself acquainted with the means of sustenance produced by the country, with the feelings of the people—whether friendly or hostile—with the transport which can be drawn from the villages, with the position and strength of fortified places, and, in short, with every particular which can be of service to his commandant. His reconnoissance finished, not without fatigue and danger, he is expected to sit down and produce an eye-map, or a full report of all he has seen and heard.

The *topographical department* is a department of the war office under the "director of surveys," who is an officer of engineers. It comprises the "ordnance survey," which is charged with the various national surveys; and the topographical depot, a collection of maps, plans, descriptive-books, and journals of staff-officers from all parts of the globe. The officers of this depot always try to keep their information posted up to the latest date, that, on an army taking the field, the general may at once be put in possession of a competent knowledge of the country he is to pass through or occupy.

TOP-SHELL. See TROCHIDÆ.

TOR (Celtic), "a projecting rock, is found in the names of mount Taurus and the Tors of Devonshire (Yes Tor, Brent Tor, etc.), and Derbyshire (Mam Tor, Chee Tor, etc.). The highest summits of the *Tyr-ol* are called *Die Taur-en*."—Taylor's *Words and Places*.

TORBANEHILL MINERAL, a name sometimes popularly given to a mineral substance also known as **BOGHEAD COAL**, found on the lands of Boghead and Torbanehill, near Bathgate, Scotland, and celebrated for its value as a source of paraffine oil or naphtha (g.v.), of which it yields a much greater quantity than any other coal or shale found in Britain. Large quantities are exported to the continent of Europe. A famous litigation took place in 1853 concerning this mineral, between a landlord and the lessees, which turned partly on the question whether it ought to be regarded as a coal or a shale, a point on which opposite opinions were expressed by eminent men of science.

TORBERT, ALFRED T. A., b Del., 1833; graduated at West Point, 1855; commissioned in the infantry. In 1861 he was made col. of a New Jersey regiment, and was present at the battles of Yorktown, Gaines's mill, and West Point. He commanded the 6th corps at the second battle of Bull Run, Antietam, and Gettysburg. He was also engaged at Cold Harbor, and through the Shenandoah valley. In 1865 he was placed in command of the army of Shenandoah. He retired with the rank of brevet brig. gen. in 1866, and has since been consul-general at Havana and in Paris.

TORCE, or **WREATH**, in heraldry, a garland of twisted silk, by which the crest is joined to the helmet. A crest is always understood to be placed on a torce, unless where it is expressly stated to issue out of a coronet or chapeau.

TORERO, JOSÉ MARIA QUEYPO DE LLANO RUIZ DE SARAVIA, Count 1786-1843; b. Spain; conspicuous in the rising against the French in 1808. He was returned to the cortes in 1810, but when Ferdinand VII. resumed authority in 1814, left the country, not returning till the death of Ferdinand. He became minister of finance in 1834, and the next year president of the council and minister of foreign affairs. He pursued a moderate policy, and was forced to resign, 1835. He wrote *History of the Insurrection, etc., of Spain* (1835).

TORGAU, a t. of Prussia, and a fortress of the second rank, stands on the left bank of the Elbe, 70 m. s.s.w. of Berlin, and 12 m. n. of the frontier of the kingdom of Saxony. The river is here crossed by a bridge 500 paces in length, and supported upon 15 stone piers. Among the public buildings are the castle, now used as a barrack and magazine, and comprising a church consecrated by Luther in 1544; a town-church, with pictures by Cranach; a gymnasium, and other schools. Weaving and brewing were once briskly carried on at Torgau, but the prosperity of the town has decayed. A battle was fought here in Nov., 1760, in which Frederick II. of Prussia defeated the Austrians. Pop. '75, 10,730.

TORGET, a small island off the n.w. coast of Norway, in lat. 65° 30' north. It serves as a landmark to sailors, is the haunt of numerous water-fowl, but is chiefly noteworthy for its lofty rock called Torgghatten (the hat of Torget), which rises to the height of 756 ft. above sea-level, and is pierced right through, near the top, by a cave or passage 80 ft. wide, and 1300 ft. long.

TORLONIA, a princely Roman family, remarkable for their wealth, and for their extraordinarily sudden rise from the very lowest condition, trace their origin to a poor "cicerone," Giovanni Torlonia (born in 1754), who hung about the piazza di Spagna in Rome, and gained a precarious living by showing visitors over the colosseum. By steadiness and honesty, he obtained a reputation in his profession, became afterward an agent of the French emissaries who were sent to excite the Roman populace to revolution, and on the failure of this project was left with considerable funds in his hands; he afterward married a widow of means, and became a merchant, gradually rising, by dint of great intelligence, keen foresight, and enterprise, to the position of a stock-broker, usurer, and money-dealer; and by acquiring mortgages over the properties of the impoverished Roman princes, and by various other happy ventures, ultimately amassed an immense fortune. He was made a grandee of Spain, and duke of Bracciano by the pope. His three sons allied themselves with princely families of the highest rank; the eldest succeeded to the dukedom, and the two others carried on their father's business. The youngest became prince of Civitella-Cesi, and duke of Ceri.

TORMENTIL, *Tormentilla*, a genus of plants of the natural order *rosaceæ*, sub-order *potentillæ*, differing from *potentilla* (q.v.) only in the 4-parted calyx and corolla, and now united with it by many botanists. The COMMON TORMENTIL (*T. officinalis*, or *potentilla tormentilla*) is a very common plant in moorish and heathy places in Britain and throughout great part of Europe. It has a large woody root, which has long been official, being an agreeable and efficacious astringent, useful in diarrhœa and other complaints; and which contains tannin, gum, and a red coloring matter, not soluble in water, used by the Laplanders for staining leather red. The leaves are ternate, the leaflets lanceolate, and inciso-serrate; the stems ascending and forking, the flower-stalks axillary and terminal, and the flowers yellow.

TORMINA is the technical term for *gripping* pains in the belly.

TORNA, a co. in n. Hungary, in the Cis-Tibiscan circle, otherwise called Turnya; the smallest county of Hungary, bounded by Zips, Abauj, Borsod, and Gömör; 229 sq.m.; pop. 23,176. Its surface is mountainous, producing small crops of hemp, and the vine is cultivated to some extent. Capital, Torna.

TORNADO. See WHIRLWIND.

TORNEA, a river, important as forming part of the boundary-line between Russia and Sweden, rises in lake Tornea, in Sweden, and flows s.e. and s. between Russia and Sweden, entering the gulf of Bothnia at its northern extremity, after a course of 250 miles. At its mouth is the small town of Tornea (q.v.).

TORNEA, a t. in Finland, situated in 65° 50' n. lat., and 24° 10' e. long., on the peninsula of Svensar, at the mouth of the Tornea, in the government of Uleaborg. The pop., which in 1875 was 892, is principally engaged in the exchange-trade with the more northern and scantily inhabited districts of Finland and Sweden, of which Tornia is the active center, as the most northerly town in the Russian empire; deals, salt-fish, tar, hemp, reindeer skins, and other peltries being brought to Tornea to be exchanged for tobacco, spirits, manufactured goods, etc. Tornea is often visited in summer by travelers, anxious to witness the singular spectacle of the sun remaining above the horizon both night and day at the summer solstice. Tornea was several times taken by the Russians from Sweden before its final cession at the peace of Frederickschamm, in 1809, when it was ceded, together with the whole of western Finland, to Russia.

TORO, or **TORRO**, an ancient but decayed t. of Spain, in the modern province of Zamora, stands on the right bank of the Douro, 21 m. e. of Zamora. It contains numerous religious houses, most of which have been allowed to fall into a state of decay; there are brandy-distilleries and brick and tile-works. Pop. 7,000.

TORONTAL, a co. in s. Hungary in the Banat, w. of Temesvar; 3,650 sq.m.; pop. 545,503. It is drained by the Maros, Theiss, Béga, and Temes rivers. The soil is remarkably fertile, producing wheat, cotton, maize, melons, flax, rice, tobacco, and the vine. Silk-worms are reared, and live stock in large numbers; mineral products are coal, copper, and lead. Capital, Pancsova.

TORONTO, the capital city of the province of Ontario, Canada, stands on the n. shore of lake Ontario, in lat. 43° 39' n., long. 79° 23' w., 165 m. from Kingston, and 323 m. from Montreal. It is over 2 m. in length between e. and w., is bounded on the s. by the bay of Toronto, a spacious inlet of lake Ontario, and is 1½ m. broad from s. to north. The scenery of the vicinity is somewhat tame, and the situation of the town is low and flat, the most elevated quarter—the Queen's park in the w. containing the university, observatory, and handsome private residences—being only from 100 to 200 ft. above the level of the lake. The harbor or bay, about 5 m. long and 1 m. in width, is formed by a curving spit of land running into the lake in a s. and w. direction to the distance of 3 miles. It is capable of accommodating the largest vessels that navigate the lakes, and is defended at the entrance by a fort, which was thoroughly repaired in 1864 by the imperial government, and mounted with the most efficient modern ordnance. Toronto has much the appearance of an English town, and is distinguished for the number of its churches—

many of which are surmounted by handsome spires. The principal are St. James's cathedral (anglican), a noble edifice in early English, erected in 1852; St. Michael's cathedral (Roman catholic); Knox's church and St. Andrew's (Presbyterian); the Metropolitan (Methodist); and the Unitarian chapel. Toronto is the fountain-head of the Canada school-system, and its educational institutions are numerous and well appointed. The university, charmingly situated in the well-wooded Queen's park, was inaugurated in 1827, and is attended by 250 students; Trinity college has about 100 students; and the upper Canada college has 200. Knox's college, recently built, is the Presbyterian theological hall. The university park, with its beautiful monument to the volunteers who fell at Ridgeway, and the Horticultural gardens, are frequented by all classes of the community. There are also the normal and model schools, in the first of which teachers exclusively are trained. Attached to the university is the observatory. There are many benevolent institutions, as hospitals, asylums, etc.; and handsome official buildings, including Osgoode hall, the seat of the supreme courts of the province; the legislative buildings; the Government house; the customs-house; and the post office. There are two large theaters in Toronto. Toronto is a station for five railways—the Grand Trunk, running e. and w.; the Great Western; the Northern; the Toronto, Grey, and Bruce; and the Toronto and Nipissing; while during open navigation, magnificent steamers ply in all directions on the lake. Cabinet-ware and iron rails are manufactured, and foundries, distilleries, and flour mills are in operation; the exports are manufactured lumber, flour, wheat and other grain. Pop. '71, 56,092, who return two members to the provincial parliament.

The name Toronto is supposed to be of Indian origin, but the meaning of the word appears to have been lost. The town was founded in 1794 by governor Simcoe. It was incorporated in 1834, was burned by the Americans in 1813, and suffered severely in the insurrection of 1837 on which occasion it was the headquarters of the rebellion, as also from fire in 1849.

TORPEDO, a genus of fishes of the order *raiiæ* (see RAY), and family *torpedinidæ*. All the *torpedinidæ* were formerly included in this genus, itself originally formed *raia*; but it has been divided into a number of genera, as *torpedo*, *narcine*, *astrape*, etc. The *torpedinidæ* have a short and not very thick tail, cylindrical toward the end, keeled on the sides. The disk is rounded, and has neither scales nor prickles. The most remarkable characteristic, however, is the galvanic battery, which all the species possess, and which is described and figured in the article ELECTRICITY, ANIMAL. The name torpedo is very commonly extended in a popular sense to all the *torpedinidæ*. Two species of torpedo are occasionally found on the southern coasts of England.—*T. vulgaris* or *marmorata*, which sometimes attains a large size, weighing 100 lbs.; and *torpedo nobilina*, which is apparently more rare. They are readily distinguished by the spiracles behind the eyes, which are round and fringed at the edges in the former, oval and perfectly smooth in the latter. These and other species are found more plentifully in the Mediterranean, and the *torpedinidæ* generally belong to the warmer seas. The popular names *numb-fish*, *cramp-fish*, and *cramp ray* are given to torpedos by English fishermen. The electric shock which a large torpedo gives when seized is so severe, that no one who has experienced it desires to experience it again.

TORPEDO. During the war between Great Britain and the United States in 1812-14, this name was applied to certain mysterious boats invented by Fulton and other Americans for the purpose of navigating beneath the surface of the water, and injuring the bottoms of hostile vessels. In those days of hand-to-hand naval war, these designs (which, by the way, were failures) were looked upon as little less than diabolical. The progress of destructive weapons during half a c. has removed this aversion. The modern torpedo is of two kinds—first, the locomotive torpedo, which is in various ways projected against the side of a hostile vessel; secondly, the fixed torpedo, a kind of stationary bomb-shell intended to explode under the bottom of the enemy's ship. To these fixed torpedos it is now more usual to give the appropriate name of submarine mines.

The weapon was first used by the Russians in the Baltic in 1854; but in the American war of secession of 1861-65 it was extensively and often successfully employed. The damage effected by a torpedo exploding beneath a ship is very great, but the failures are very frequent by the explosion happening at a wrong moment. In the Franco-German war of 1870-71; the French fleet was effectually scared from the Prussian ports by the dread of torpedos. Torpedos were much employed in the Russo-Turkish war of 1877.

Of fixed submarine mines there are two classes—those which are self-explosive on a ship touching them, and those which are dependent on an electric current supplied from the shore. A torpedo of the self-acting class is shown in fig. 1: *abc* is a hollow iron cone, water-tight, with a ring at *b* by which to anchor it. The upper part, B, is left empty, for the sake of buoyancy, while the lower end, A, is filled with gunpowder, the charge varying from 100 to 300 lbs. At the top of the powder is an iron case, C, filled with lime, and in it a tube of thin glass, D, containing sulphuric acid. The upper part of the glass tube is enveloped by the ringed end of the iron rod, E, which passes through the top of the torpedo, and some distance above it; and has horizontal rods, G, called feelers, attached rigidly to its upper extremity. When a ship impinges on the feelers, the rod is

deflected from the perpendicular; the ring at its lower end breaks the glass tube; the acid acting on the line, generates great heat, and explodes the powder.

In the electric torpedo a wire insulated in a small cable is laid from a battery on shore to the sub-marine mine. It enters it by an insulated joint, and is then soldered to a small piece of platinum wire placed in the middle of the priming of the torpedo; from the other end of the platinum a second wire communicates with the metal sides of the torpedo case. On closing circuit at the battery, the current passes by the cable into the torpedo, heating the platinum to incandescence, and exploding the mine. There is thus no need of a second cable; the water and the earth take its place. Submarine mines are usually charged with gun-cotton, which has the great advantage of

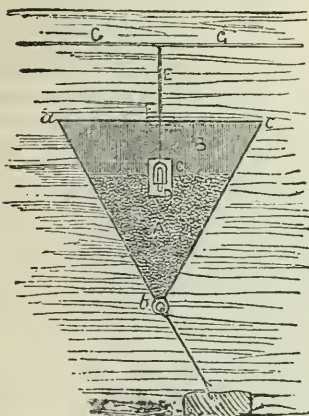


FIG. 1.

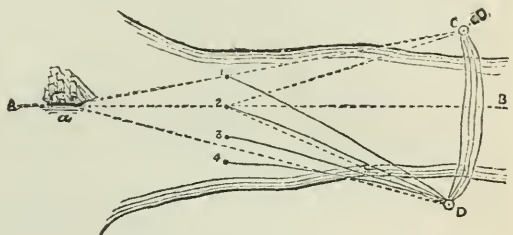


FIG. 2.

being explosive by means of a fulminating fuse, even when wet through leakage of the torpedo case.

Submarine mines are usually moored or laid on the bottom in several lines, the mines of the second line being opposite the intervals of the first, so that it is difficult for a hostile ship to pass up a defended channel without coming within reach of one or more of them. As a ship approaches, her course is carefully watched so as to fire a mine at the right moment. In order to explain how this is done, let us take the case of the channel AB.

Two or more lines of mines are laid down across its mouth. For the sake of clearness we show only a few of those of the first line in the diagram. At C and D two stations are selected, commanding a view of the defended waters. At C is the voltaic battery, and the wires from the mines connect them with D, while a second series of wires, each corresponding with one of the first series, connects D and C. There are thus two breaks in the circuit of every mine, one at C, where a number of "firing keys" are arranged so as to place at will the battery in connection with any of the wires; the second break is at D, where similar firing-keys connect at will each wire of one series with the corresponding wire of the other. A ship is seen approaching on the course AB. When she is at *a* the observer at C notices that her bearing is the same as that of mine No. 1. He therefore closes the break in the first circuit by means of the firing-key, but no current passes, for the observer at D sees her well to the left of the bearing of mine No. 1, and therefore leaves his break open. Not until she is actually over No. 2 will both observers at the same moment see that her bearing corresponds to that of No. 2, and closing both breaks in the circuit, fire the mine. By means of a telescope combined with the firing-key, these bearings can be taken with great accuracy. In some cases the ship herself is made to close the circuit in striking a rather complicated apparatus called a circuit-closer, which floats above each of the mines arranged on this system.

Of locomotive torpedoes there are three classes: (1.) The Whitehead fish torpedo, which has a fish-shaped case, and is propelled in a straight line under water by means of a small screw propeller driven by compressed air. It is discharged from a carriage on the deck of a man-of-war, and explodes on impact against the object aimed at. The secret of the construction has been sold by the inventor to the Austrian, Russian, and English navies. (2.) The Harvey "towing torpedo," which is towed out at an angle from the side of the attacking ship, and maneuvered so as to come in contact with the bottom of the ship attacked. It is exploded either mechanically on contact, or by means of an electric fuse, the wire being inserted in the towing line. (3.) Boom or outrigger torpedoes, which are carried on long booms in the bows of boats or steam-launches, and thus driven against the side of a hostile ship and exploded. Torpedo boats are becoming a special feature of European navies; they are swift steamers not more than 60 ft. long, lying low in the water, and steaming up to 19 knots an hour. Admiral Porter has designed for the American navy an ocean-going torpedo steamer of larger size, but similar build.

For fuller information on this wide subject, see "Torpedoes" in *Fraser's Magazine*, April, 1872; and the illustrated articles by A. H. Atteridge and cap. Dede Brown in the *Popular Science Review*, April, 1873 and Oct. 1875; also the illustrations in the *Illustrated London News*, June 16, 1877.

TORPEDO (*ante*). The machine is a development of an idea which dates back to the invention of gunpowder—the petard on land, the powder-ship at sea; but Bushnell, of Connecticut, appears to have invented at once, during our war of the revolution, the two factors of success—a sunken boat and an explosive torpedo. His was exploded by clock-work, and is of the first, or *applied* kind, the true torpedo; though he afterward experimented, and as fruitlessly as usual, with the second kind, the *drifting* torpedo, or infernal machine. The third variety, the *sunken*, is the submarine mine. The drifting torpedo is usually sunk by a line from a log or keg, and explodes when driven up against an obstacle by the tide or current. During the Turkish war of 1877-78 a floating can with surrounding arms was in use, as also a shuttle-shaped torpedo with a surrounding ring. All are evidently precarious in their action, and dangerous to all, whether friends or foes, who may chance to encounter them. If their use cannot be discontinued by national agreement, it seems only fair that any caught setting them should be subjected to martial law forthwith, ranking by right with spies, marauders, and private corps. There has yet been no fair trial by an invading fleet armed with the latest appliances of the efficiency of the third, or submarine mine. The Turks, with divers and the electric light, cut loose and raised the Russian torpedoes; nor is it necessary for this to capture the firing-stations. The English, working on the fact that the explosion under water of the equivalent of 300 lbs. of powder will explode all mines within a radius of 100 yards, invented a steam launch, directed by wires, which could be sent ahead, could drop two torpedoes, retire, and finally explode them, without other handling than the battery-wires. It has not yet been tried, and probably, in a sea-way, never will be. Nothing is so effective as the torpedo run out by a spar and exploded by a battery. Ours of the late war were percussive. The torpedo-boat invented by admiral Porter, and constructed before the Turkish war, is an almost submerged steam launch, of iron, with a double skin, carrying four persons—the spar-man, who commands and manages the torpedo, the battery-man, a steersman, and an engineer. The idea was borrowed by the English about 1878, but almost all these boats are too large for the purpose. They carry a spar from the bow, and sometimes one on either side. The torpedo is launched, by dropping the spar, so as to strike the enemy at about 10 ft. below water; and a bowsprit, often with a spring buffer, prevents the launch approaching nearer than 20 ft. at the least, the limit of safety for the equivalent of 150 lbs. of powder. The Whitehead and its American prototype, the Harvey, and other towed torpedoes, and boom or spar torpedoes from a vessel itself, are all either uncertain in effect or impotent when in action and in a sea-way, from the very necessities of the case. Defense against torpedoes lies in booms of logs, with nets and, if possible, battery attachments, to show where the attack is made, and guns ready trained on certain points. Against torpedo-boats Hobart pacha was the first to use a cordon of logs, made fast by lines to his yard-arms, and boomed out from the hull. Nets, and now wire-netting, have been substituted, with a line of spars all round to keep them at proper distance. The electric light should be used, with patrol boats, and a sufficient number of handy guns should be kept in readiness, so as to be quickly trained on any point. Gatling guns in the tops will pierce any common launch, made as they are of boiler iron; and the English rocket battery might be found useful. Better than anything is the new Hotchkiss repeating gun, and it is a question whether two patrol-boats, armed with this and a spar torpedo, will not prove a sufficient protection against the only thing that has yet proved an entire success, an open launch, manned by a resolute crew.

TORQUAY, a watering-place on the s. coast of Devon, occupying a cove on the n. side of Tor bay, 23 m. from Exeter, and about 210 from London. The name is derived from the Celtic "tor" (q.v.), a hill, which occurs in the appellations of the neighboring peaks of Dartmore (Hey Tor, Rippon Tor, etc.), and thence is given to the bay, and to the ancient parish of Tormohun or Tormoham, in which Torquay is situate. The monastery of Tor abbey was founded in the 12th c.; but the town of Torquay is of recent origin. The bay is noted in history as the place where William of Orange landed in 1688, and was often used as a naval rendezvous during the war with France; but till the beginning of the present century Torquay was little more than an assemblage of fishermen's huts. About that time the advantages of its climate—which are a peculiarly sheltered position, an equable temperature, and freedom from frogs—caused it to be resorted to by consumptive patients; and it soon attained a European celebrity, which is still almost unrivaled. The romantic hills and valleys of Tormohun and its environs are being rapidly overspread with villas, gardens, terraces, and rows of smaller dwellings. The original parish has been divided into four, and possesses 6 (English) churches, 1 Roman Catholic, 1 Scotch Presbyterian, and numerous dissenting chapels. A stone pier was built in 1803, and the port is resorted to by colliers and small traders. The present high-road to Newton-Abbot was made about 1825; and the first station of the South Devon railway was opened in 1845. The geological formation consists mainly of a range of transition limestone cliffs in strata much contorted, forming an excellent building material; and in some places, as at Petit Tor, presenting beautifully-tinted marbles, which are extensively worked. The limestone gives place at some points to old red sandstone, which gives its predominating color to the soil, and to argillaceous shale in beds of considerable thickness. The scenery is of the most varied and pictur-

esque description. Besides the mildness of the winter, the vicinity of the sea in front, and of Dartmoor in the rear, greatly moderates the summer climate, so that while the mean winter temperature is 44° , being 3° above that of Greenwich, that of the summer is only 55° , nearly 1° below that of Greenwich. The population has increased from under 1000 in 1801 to 21,657 in 1871. Kent's cavern, discovered in 1824, and the Brixham cave, discovered in 1858, are rich in fossils, and are among the earliest places in the kingdom in which prehistoric human remains have been found.

TORQUEMADA, JUAN DE, Cardinal, 1388-1438; b. Spain; became a Dominican friar, 1403; graduated at the university of Paris, 1424; prior of convents at Valladolid and Toledo; made master of the sacred palace at Rome, 1431; assisted at the condemnation of the doctrines of Wycliffe and Huss, and advocated the dogma of the immaculate conception; drew up project for union between Latin and Greek churches at council of Florence, 1439, for which he was made cardinal, and called the "defender of the faith;" made bishop of Palestrina, 1455, and of Sabina, 1464. His *Meditations* was among the first books printed at Rome.

TORQUEMADA, TOMAS DE, 1420-98; b. Spain; became a Dominican monk and prior of a monastery at Segovia; appointed inquisitor-general of Spain by Ferdinand and Isabella, 1483, and confirmed by the pope with the title "confessor of sovereigns;" labored zealously in organizing the inquisition throughout Spain, particularly at Seville, Cordova, Jaen, and Ciudad Real; drew up the code of procedure; was prominent in the expulsion of the Jews and Moors from Spain; and during 16 years caused to be burned at the stake between nine and ten thousand persons. In the later years of his life, pope Alexander VI. reduced his authority by associating with him four colleagues.

TORREARSA, VICENZO, Marquis, b. Sicily, 1808; president of the committee of finance and of the Sicilian parliament during the revolution of 1848, and proclaimed the duke of Genoa king of Sicily. He was the head of the ministry and minister of foreign affairs till the return of the Bourbons, when he went to Nice. In 1860 he entered Palermo with Garibaldi and sat in a Sicilian constituent assembly called at his suggestion, and he carried to Victor Emmanuel the vote of Sicily for union with Italy. He has since been ambassador to Sweden and Denmark, prefect of the city of Florence, and president of the Italian senate.

TORQUES (Celtic, *tore*; Lat. *torqueo*, I twist), a species of gold ornament, meant to be worn round the neck, which was much in use in ancient times, both among Asiatic and north European nations. It consisted of a spirally twisted bar of gold, bent round nearly into a circle, with the ends free, and terminating in hooks, or sometimes in serpents. These ornaments seem to have formed an important part of the wealth of those who wore them, and of the plunder obtained by the Roman conquerors from a Celtic or oriental army. A monument erected to a Roman soldier not unfrequently specified the number of torques that had been conferred on him. Numerous examples of the torques have been dug up in Great Britain and Ireland, as well as in France, and are to be found in archæological collections. Both in Europe and in Asia, the torques resembled one form of bracelet (q. v.) on a larger scale.

TORRÉ DEL GRECO, a city of southern Italy, at the base of Vesuvius, 7 m. from Naples. Its pop., though often reduced after the eruptions, was 18,950 in '71. The town is always new, being from time to time destroyed by the lava, and always raised again from its ruins, by the attachment of its inhabitants to their native soil. The soil is fertile, producing fruit and wines similar to those of Greece. Its inhabitants are engaged in the tunny, oyster, and sardine fisheries. Mention is made of the town under its present name (the origin of which is unknown) as early as 1324 A.D. It suffered much in the eruption of 1631, and in that of 1794 it was almost totally destroyed by the lava. The earthquake of 1856, and the eruption of 1861 when the town was overwhelmed by vast showers of ashes, were equally destructive. But Torre del Greco has always risen again from its ruins.

TORRÉ DELL' ANNUNZIA'TA, a thriving t. of southern Italy, stands on the southern base of mount Vesuvius, 13 m. s.e. of Naples. A fishery and a coasting-trade are carried on. Pop. 15,321.

TORRENS, LAKE, sometimes a brackish lake, at others, merely a salt-marsh, in s. Australia; lat. $30^{\circ} 11'$ to $32^{\circ} s.$; and long. $137^{\circ} 30'$ east. It lies 30 m. n. of Spencer gulf. Length, 130 m.; breadth, 18 to 20 miles.

TORRES STRAIT lies between n. Australia and Papua or New Guinea, in lat. $9^{\circ} 20'$ to $10^{\circ} 40'$ n.; and long. $142^{\circ} 30'$ east. The channel is about 80 m. in width; and its navigation, though practicable, is rendered dangerous and difficult by the innumerable shoals, reefs, and islands with which it is strewn. It was discovered by Torres in 1606.

TORRES-VE DRAS, a t. of Estremadura, kingdom of Portugal, on the left bank of the Sizandro, about 30 m. n. of Lisbon. It has a pop. of about 3,300, and carries on some trade in wine; but derives its reputation solely from having given name to those famous lines of defense within which Wellington took refuge in 1810, when he found it impossible to defend the frontier of Portugal against the French armies; and from which in the year following, he issued on that career of slow and hard-won victory, which

ended in the expulsion of the French from the peninsula. The *first*, or outermost of these lines, extending from Albandra, on the Tagus, to the mouth of the Sizandro, on the sea-coast, and following the windings of the hills, was 29 m. long; the *second* (and by far the most formidable) lay from 6 to 10 m. behind the first, stretching from Quintella, on the Tagus, to the mouth of the St. Lorenza, a distance of 24 m.; the *third*, situated to the s.w. of Lisbon, at the very mouth of the Tagus, was very short, being intended to cover a forced embarkation, if that had become necessary. The entire ground thus fortified was equal to 500 sq. miles.

TORREY, CHARLES TURNER, 1813-46; b. Mass.; graduated Yale college, 1833, studied theology with Dr. Ide of Medway; was settled at Princeton and Salem, Mass., but left the pastoral work to labor for the abolition of slavery. Detected in aiding slaves to escape from Maryland, he was tried, convicted, and imprisoned in the state prison at Baltimore, where he died of consumption. His remains were taken to Mount Auburn cemetery, Mass. He published *Home, or the Pilgrim's Faith Reviewed*; written while in prison; *Memoir of W. R. Sarton*.

TORREY, JOHN, LL.D., 1796-1873; b. N. Y.; graduated New York college of physicians and surgeons, 1818; one of the founders of the New York lyceum of natural history, of which he was many years president; professor of chemistry, geology, and mineralogy at West Point, 1824-27; of chemistry and botany in the college of physicians and surgeons, 1827-55; of chemistry and natural history in the college of New Jersey, 1830-54; chief assayer in the U. S. assay office, New York, 1853-73. His publications are: *Catalogue of Plants Growing Spontaneously within Thirty Miles of New York*; *Flora of the Northern and Middle States*; *Compendium of the Flora of the Northern and Middle States*; *Cyperaceae of North America*; *Flora of the State of New York*; with prof. Asa Gray began, 1838, the publication of *Flora of North America*. He prepared the *Botanical Reports* of various land exploring expeditions of the United States, 1822-58; *Appendix* to Dr. John Lindley's Introduction to the Natural System of Botany; contributed many papers on chemistry, mineralogy, and botany to the *Annals* of the lyceum of natural history, N. Y., the *Medical Repository*, *Silliman's Journal*, *Smithsonian Contributions*. His valuable herbarium and botanical library he presented in 1860 to Columbia college.

TORREY, JOSEPH, D.D., 1797-1867; b. Mass.; graduated Dartmouth college, 1816, and Andover, 1819; pastor of a church at Royalton, Vt., 1819-27; professor of Greek and Latin in the university of Vermont, 1827-42; of mental and moral philosophy, 1842-67; and president of the university, 1863-65. He translated Neander's *General History of the Christian Religion and the Church*, with copious learned notes; edited *Remains* of president James Marsh and *Select Sermons* of president Worthington Smith. A posthumous volume of lectures on *A Theory of Art* was published.

TORREY, JOSEPH W., b. Maine, 1828. In 1859 he went to China and for a time was editor of the *Hong Kong Times*. He engaged in trade, acquired great influence among the native merchants, and in 1867 became (under the sultan of Borneo) rajah of Maloodu and Ambong in Borneo, districts containing over 2,000,000 inhabitants, and also was made president of the "American trading company."

TORREYA, a genus of the order *conifera*, somewhat resembling the yews. There are many species of the tree, which was named after John Torrey, the botanist. In this country the best specimens are the *Torreya California* and *taxifolia*. The latter, found in Florida, reaches the height of 50 ft., and has a close grained and strongly scented wood. Other varieties are found in India, China, and Japan.

TORRICELLI, EVANGELISTA, a celebrated Italian mathematician and philosopher, was born at Piancaldoli in the Romagna, Italy, Oct. 15, 1608. He was brought up by an uncle who resided at Faenza, and who put him under the tuition of the Jesuits. When 20 years old, he was sent to Rome, and there devoted himself to mathematical studies. Galileo's theories on force and motion, which had been published a short time before, especially engaged his attention, and led to his publishing a *Trattato del Moto* (1643), a meritorious work, but containing few new discoveries of consequence. The publication of this work led to his being invited by Galileo to visit him; and on the old philosopher's death, three months afterward, he was appointed to succeed Galileo in the chair of philosophy and mathematics at Florence. Here he resided till his death in 1647. The discovery which will preserve Torricelli's name through all ages was the interpretation of the previously known fact, that water will rise in a suction pump only to the height of about 32 feet. The fact that water *could* be raised in a pump was expressed by the empirical law, that "nature abhors a vacuum," and after the limit of 32 ft. was ascertained, the law was modified accordingly by Galileo. Torricelli wishing to perform this experiment more conveniently, employed mercury, and found that nature's abhorrence of a vacuum varied for different fluids, and was represented by a column of fluid in height inversely proportional to its specific gravity; here, then, was an additional fact of importance, containing the clue to the mystery, and Torricelli was not long in hitting on the idea that the column of fluid was sustained by the pressure of the atmosphere on the open surface of fluid. See BAROMETER. Torricelli also effected the quadrature of the cycloid, but in this was anticipated by Roberval.

TORRINGTON, a municipal borough and market t. of the c. of Devon, on an eminence sloping to the Torridge, 10 m. s. s. w. of Barnstaple. The inhabitants, who slightly decreased in numbers between the years 1851 and 1861, are employed for the most part in agriculture and glove-making; but the industry is inconsiderable. Pop. '71, 3,529. The name of Torrington emerges frequently during the great civil war; and the capture of the town by Fairfax in 1646, on which occasion the church, with 200 prisoners, and those who guarded them, were blown into the air by gunpowder, proved fatal to the king's cause in the west.

TORSHOK, one of the most ancient towns in Russia, in the government of Tver, stands on the Tverza, in an undulating district, 309 m. s.e. of St. Petersburg. Leather and malt are the most important branches of manufacture; but the gold and silk embroideries of this town are well known throughout the empire, and obtained much celebrity at the London Exhibitions of 1851 and 1862. There is an extensive trade in corn, which the merchants of Torshok purchase in the neighboring districts and at the landing-places of the lower Volga, and thence transport to St. Petersburg by water. Much of this corn is ground at Torshok and the flour exported. The town was founded in the 11th century. Pop. '67, 15,147.

TORSION is a method of common application in surgery for the purpose of checking arterial hemorrhage in certain cases. The wounded vessel is drawn out and fixed by a pair of forceps a quarter of an inch from the end; the end of the artery is then twisted round till it will not untwist itself. It is especially useful when there are many small arteries wounded in an operation, as, for example, in the extirpation of a large tumor.

TORSION-BALANCE, (Lat. *torsio*, twisting) is an instrument first invented by Coulomb, in which the force exerted by a twisted thread or filament to recover its original position, is made the means of measuring small degrees of electrical and magnetical attraction. See ELECTRICITY. It has also been used in determining the mass and density of the earth. See EARTH.

TORSK or, by corruption, **TUSK** (*Brosminius vulgaris*), a valuable fish of the family *gadidae* (q.v.), abundant in the northern parts of the Atlantic ocean. The genus is characterized by a single long dorsal fin, and by having the vertical fins separate. The torsk is from 18 in. to 2 ft., rarely 3 ft. long; the head small, the body moderately elongated, one barbule under the chin, the dorsal and anal fins distinct from the tail, although separated from it by a very short interval; the tail rounded; the head dusky; the back and sides yellow, passing into white on the belly. It lives in deep water, approaching the land in shoals only at the spawning-time, which is very early in the year. It spawns among the sea-weed of the coast. It is caught in the same manner as cod, ling, etc.; and although rather firm and tough when fresh, is generally esteemed, when dried and salted, to be the best of stock-fish. It is occasionally caught in the firth of Forth, but belongs to more northern regions, and is very abundant in the Shetland isles, the Faroes, on some parts of the coast of Norway, and on the s. and w. coasts of Iceland.

TORSO (Ital.), strictly, signifies a trunk, e.g., the trunk of a tree, but is specially applied to an ancient statue of which only the body remains. Of such imperfect relics of classic art, the most famous is the *Torso of Hercules*, a masterpiece of manly beauty, discovered in the Campo del Fiore at the beginning of the 16th c., and placed, by order of pope Julius II., in the Vatican.

TORSTENSOHN, LEONARD, Count of Ortala, the most active, enterprising, and successful of the Swedish generals who were engaged in the Thirty Years' war (q.v.), was born at Torstena, Aug. 17, 1603, became one of the royal pages in 1618, and attended Gustavus Adolphus in most of his earlier campaigns. When Gustavus entered Germany in 1630, Torstensohn was capt. of the body-guard; and the brilliant services he rendered at Breitenfeld, the Lech, and on other occasions, were rewarded with rapid promotion. Taken prisoner at the combat of Nuremberg (Aug. 24, 1632), he was subjected to rigorous treatment, which so ruined his health, that on his exchange six months after, he returned to his post in the Swedish army a confirmed invalid; yet a vigorous mind and energetic character so overmastered bodily infirmity, that though reduced to the necessity of being always conveyed in a litter, he proved himself a most able officer under Bernhard of Weimar and Baner, the successors of Gustavus. In 1641, on the death of his former chief, the able and chivalrous Baner, he was appointed to the command-in-chief of the Swedes in Germany. His military career was marked by a brilliancy of conception, fertility of resource, resolute daring, and above all, by an extraordinary rapidity of execution, which broadly distinguished it from those of his contemporaries, and set at naught all the precautionary and defensive measures of his opponents. Having recruited and equipped his army, he invaded Silesia, routed the Austrians at Glogau and Schweidnitz, reduced most of Moravia, and being pressed back into Saxony by the archduke Leopold and Piccolomini, gallantly turned upon the multitude of his pursuers (Nov. 2, 1642), and on the field of Breitenfeld, where Tilly's reputation for invincibility was cast down in the dust by Gustavus, inflicted a bloody defeat on the same adversaries; he then resumed the execution of his plans of invasion, and laid Moravia and Austria under contribution. Ferdinand III., despairing of protecting his territories from Torstensohn, negotiated with Christian IV. of Denmark to make a

diversion by invading Sweden; but Torstensohn, with characteristic promptitude, left Moravia in Sept., 1643, traversed Saxony and the Upper Palatinate, burst into Holstein, and in less than six week subjugated the Danish mainland. The Austrians under Gallus followed in pursuit of him, to aid their allies, but arrived too late; and in attempting to coop him up in Holstein, were routed, and driven into Saxony; and again totally defeated (Nov. 23, 1644) at Jüterbogk, in attempting to bar his return into Bohemia. Gallus was now deposed; but a combination of talented generals, as Montecuculi, Goertz, and others, was found to be equally ineffective against the resistless Swede, who, by a great victory at Yankovitz (Feb. 14, 1645), secured the navigation of the Danube, and the possession of the hereditary countries north of it. The emperor, empress, and principl nobility now deserted the capital; the Saxons again joined the Swedes; and the Danes, routed at sea as well as on land, besought peace, which was granted (Aug. 13, 1645). At this time, when a few more of Torstensohn's weighty blows would have completely unseated the Hapsburg family, his gradually increasing ailments compelled him to resign the command to one very much his inferior, and retire to Sweden, where he experienced a most distinguished reception from queen Christina, was created a count, and appointed to various high offices successively. He died at Stockholm, April 7, 1651.

TORT (Lat. *tortus*), in the law of England, includes all these wrongs for which a remedy by compensation or damages is given in a court of law, and which wrongs arise irrespective of any contract. Such are assaults, imprisonments, taking one's goods without title, injury to one's body or character. The general rule of law was, that the right of action for a tort died with the person who committed it; but this defect has been cured by a statute to a certain extent. If the wrong was done within six months preceding the wrongdoer's death, an action may be brought against his executors within six months after they have assumed office. So if the injured party lived, he could always bring an action of damages; but if he died, his executors or relatives could not do so, until lord Campbell's act enabled the wife, husband, parent, or child of such deceased injured party to sue for damages; and in such case the jury may apportion the damages between the widow and children who sue. The right to bring an action for a tort is limited to two, four, or six years respectively, according to the nature of the wrong.—In Scotland, there is no time limited for bringing the action.

TORT (*ante*) in law, differs from a breach of contract in these respects: that the death of either party to the tort ends the right of action, that joint tort-feasors are severally liable, with no right of contribution from each other; and that persons under disability to contract are liable for their torts. One of the chief distinctions between torts and crimes is that in the latter a criminal intent must be proved, while in the former intent is immaterial; yet in some torts, e.g., slander or malicious prosecution, a malicious intent is essential. Torts may be committed against the person, as assault and battery, false imprisonment; or against one's character, as libel and slander; or against property, as trespass or trover. An injured party cannot recover for an injury in any way contributed to by his own wrong; and to maintain an action there must be a loss as well as a wrong.

TORTEAU. See **ROUNDLE**.

TORTOISE, *Testudo*, a genus of chelonian reptiles, which once included the whole order, but is now much restricted. The popular name tortoise is never given to the marine chelonians, which are called turtles (q.v.), and although it is sometimes given—generally with a prefix, as marsh tortoise, river tortoise, fresh-water tortoise—to the kinds which inhabit fresh water (see **EMYS** and **TERRAPIN**), yet, when used by itself, it is commonly the designation of what are distinctively called land tortoises, which belong to the genus *testudo* as now restricted, and the genera most nearly allied to it. In *testudo* the carapace is of a single piece, bulged, and soldered by the greater portion of its lateral edges to the *plastron* (see **CHELONIA**); the legs are very short; the toes are very short, and united to the nails, which are thick and conical, five on the fore-feet, and four on the hind-feet. The species are numerous and widely distributed, inhabitants of the warmer temperate and of tropical countries. They all feed on vegetable food. None of them are found in Britain, but several in the countries around the Mediterranean. The most common of these is the **GREEK TORTOISE** (*T. Græca*), which attains a length of 12 in., and has a broad and equally bulged carapace; the scales of which are granulated in the center, striated on the margins, and spotted or marbled with black and yellow. This is the species of an individual of which a most interesting account is given by White in his *Natural History of Selborne*. It lives to a very great age, 100 years or more, as probably do all the other species, and spends the winter in a dormant state, as do all those which are not inhabitants of tropical climates; selecting for itself a place of hibernation when cold weather begins to come on, or preparing it by scooping a hole in the earth. During the heat of summer it feeds voraciously; but in colder weather, both before and after its hibernation, it eats little. The love-season, which is in the beginning of summer, is one of great activity, and tortoises express their amorous desires by striking their shells against those of their mates. The Greek tortoise is used for food in some parts of the s. of Europe. The flesh of all species of tortoise appears to be good for food, and the eggs of all are regarded as delicacies. A very large species is the Indian tor-

toise (*T. Indica*), if several species are not confounded under that name. It has been found on the coast of Coromandel, $4\frac{1}{2}$ ft. in length, its bulge being about 14 inches. It is particularly abundant in the Galapago islands, and has even been supposed by Darwin to be originally a native of them, and to have been diffused from them by the buccaneers over other tropical regions. It is known that the buccaneers often carried away tortoises alive from the Galapagos, but this fact does not seem probably to account for the abundance of the species in other places. The Galapago tortoise is often 200 lbs. in weight. Its flesh is of excellent quality, as are also its eggs. It forms tracks from the arid districts near the shore to the high districts of the islands, where there are springs, for the purpose of drinking; and these tracks, which are broad and well beaten, are traversed apparently at irregular intervals, the animal swallowing a very large quantity of water at a time, so that its bladder is greatly distended, and the water contained in the bladder is at first almost pure, and is gradually absorbed. The numbers of tortoises in some tropical and subtropical countries are very great. Prof. E. Forbes speaks with admiration of the numbers of *T. Græca* and *T. marginata* straying about the plains of Lycia, and browsing on the fresh herbage in spring. Darwin describes the tortoises of the Galapagos as very numerous; and Leguat, in his account of the French Protestant expedition to the island of Rodriguez, in the beginning of last century, declares that the tortoises often came out together in such numbers to feed, that a man might have walked for a considerable distance on their backs as on a pavement.

Tortoises exhibit very little intelligence; they are, however, capable of recognizing the hand that feeds them.

TORTOISE (ante). The *testudo polyphemus*, or tortoise-gopher of the southern states, (*xerobates Carolinus*, Ag.) has a shell fourteen or eighteen inches long, and burrows in the ground, digging holes four or five feet deep. They prefer the pine barrens, where they often live in troops. They are very strong, being capable of carrying a weight of over 200 pounds. The females are the largest, and their eggs are valued as food, as is the flesh of both sexes. See GOPHER.

TORTOISE PLANT. See HOTTENTOT'S BREAD.

TORTOISE-SHELL, the large scales of the carapace, or shield, of a species of sea-turtle, the *chelonia imbricata* and *testudo imbricata* of several authors—*caretta imbricata* of Dr. Gray. It is found in the Indian ocean, Amboyna, New Guinea, Seychelles, Havana, and the Red sea. Tortoise-shell is so called because formerly the order of animals to which it belongs was little known, and all were confounded under the general name of tortoises. A remarkable peculiarity in this species is the arrangement of the thirteen plates forming the carapace, which, instead of being joined together by their edges, so as to make apparently one piece, are thinned off at their edges, and overlap each other like the tiles of a roof. They vary in size according to the part of the shield they occupy. The larger are sometimes from a foot to 18 in. long, by 6 in. broad; the thickness rarely exceeds the eighth of an inch. The beautiful mottled color and semi-transparent characters of this material are well known. A remarkable quality is possessed by tortoise-shell, which very greatly increases its usefulness for the ornamental purposes to which it is generally applied—that is, its property of being easily softened by a heat equal to boiling water, and of retaining any form when cold which has been given to it when heated. Pieces can also be welded together by the pressure of hot irons properly applied. In Britain, the chief use of tortoise-shell is making combs for the hair; but it is also used for inlaying small pieces of ornamental furniture and various other fancy objects. In India, China, and Japan its use is well understood, and some very beautiful articles are made of it, exhibiting great skill and taste. Great Britain alone consumes about $15\frac{1}{2}$ tons, of the value of about £24,000.

TORTOLA. See VIRGIN ISLANDS.

TORTONA (anc. *Antilia*, or *Dertona*), a t. of northern Italy, in the province of Alessandria, and situated on the right bank of the Servia (a small river which flows n. to join the Po), and 13 m. e. of Alessandria, with which it is connected by railway. Pop. 71, 8,620. The principal buildings are the *Duomo* and church of San Francesco. Tortona has manufactures of silk, leather, hats, etc. It was a notable place in the middle ages—the old walls, and the ruins of a castle in which Frederick Barbarossa lived, being a relic of those turbulent times.

TORTOSA (anc. *Dertosa*), an old and fortified t. of Spain, province of Tarragona, picturesquely situated on a sloping eminence, overlooking the Ebro, from the mouth of which it is distant about 22 miles. The streets are narrow, and the place has altogether a dull look. Some inconsiderable manufactures are carried on, and the sturgeon and lamprey fisheries afford employment to considerable numbers. Pop. upward of 20,000.

TORTUGAS (Sp. Turtles), a group of ten islets or keys, also called the Dry Tortugas, belonging to the United States, at the entrance of the gulf of Mexico, 120 m. w.s.w. of cape Sable, the s. point of Florida. They are low coral islets, partly covered with mangrove bushes. There is a light-house on Bush Key; and on the same island stands fort Jefferson, garrisoned by about 100 men. During the civil war the fort was used as a penal station for confederate prisoners.

TORTURE. Examination by torture, otherwise called "the question," has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses, or confessions from accused persons. In ancient Athens, slaves were always examined by torture, and their evidence seems on this account to have been deemed more valuable than that of freemen. Any one might offer his own slave, or demand that of his opponent, to be examined by torture; and it was supposed to constitute a strong presumption against any one that he refused to give up his slave for that purpose. No free Athenian could be examined by torture, but torture seems occasionally to have been used in executing criminals. Under the Roman republic, only slaves could be tortured, and, as a general rule, they could not be tortured to establish their master's guilt. Under the empire, torture, besides being much used in examining slaves, was occasionally inflicted even on freemen, to extract evidence of the crime of *læsæ majestatis*. Cicero and other enlightened Romans wholly condemned its use. Until the 13th c., torture seems to have been unknown to the canon law; about that period, the Roman treason-law began to be adapted to heresy as *crimen læsæ majestatis Divinæ*. A decree of pope Innocent IV. in 1282, calling on civil magistrates to put persons accused of heresy to the torture, to elicit confessions against themselves and others, was probably the earliest instance of ecclesiastical sanction being adhibited to this mode of examination. At a later period, however, torture came to be largely employed by the inquisitors.

From the civil war, torture became a part of the legal system of most European countries. It was adopted early, and to a large extent, by the Italian municipalities. In Germany, elaborate apparatus for its infliction existed, not merely in the dungeons of the feudal castles, but in the vaults beneath the town-halls of Nuremberg and Ratisbon, where the various implements used are yet to be seen. It continued to be practiced in the prisons of Germany when they were visited by Howard in 1770. In France it was part of the judicial system till 1789, and in Scotland it was still in frequent use after the restoration, and was only abolished by 7 Anne, c. 21, s. 5.

The use of torture seems always to have been repugnant to the genius of the law of England: though occasionally used by an exercise of prerogative, it may be doubted whether it was ever recognized as lawful in the ordinary course of the administration of justice. The first instance we have of its use is in 1310, in aid of the ecclesiastical law, during the struggle between pope Clement V. and the templars. Edward II., when applied to to sanction the infliction of torture by the inquisitors in the case of certain templars accused of heresy and apostasy, at first refused; but on a remonstrance by Clement, he referred the matter to the council; and on the recommendation of the council, the inquisitors were authorized to put the accused to the torture, but without mutilation or serious injury to the person, or effusion of the blood. During the Tudor period, the council assumed the power of directing torture-warrants to the lieutenant of the Tower, and other officers, against state prisoners, and occasionally also against persons accused of other serious crimes; and similar warrants were at times issued under the sign-manual. Under James I. and Charles I., torture was less resorted to, and only in state trials. In 1628, in the case of Felton, the assassin of the duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. Torture was inflicted for the last time in England in May, 1640. It is now disused in all countries of Europe, and is universally acknowledged to have been a most unsatisfactory mode of getting at the truth; often leading the innocent, from weakness of body, to plead guilty to crimes which he had not committed.

The instruments of judicial torture have been various. The most celebrated is the rack, an oblong horizontal frame, on which the accused was stretched, while cords, attached to his legs and arms, were gradually strained by a lever or windlass, an operation which, when carried to extreme severity, dislocated the joints of the wrists and ankles. It is as old as the 2d c. in the south of Europe, but is said to have been unknown in England till introduced into the Tower by the duke of Exeter, constable of the Tower, whence it acquired the name of the "duke of Exeter's daughter." In Germany, the rack was sometimes furnished with a roller, armed with spikes, rounded off, over which the sufferer was drawn backward and forward. A vertical rack was also in use in that country. The person subjected to it was raised to the roof by a rope attached to his arms, which were bound behind his back, and two heavy stones having been attached to his feet, the rope was loosened so as to let him fall with a jerk to within few inches of the ground. Among the lesser tortures may be mentioned the thumbikins, boots, pincers, and manacles; and in England, an instrument called the Scavenger's (properly Skellington's) daughter, the invention of sir William Skeffington, lieutenant of the Tower in the reign of Henry VIII.

TO'ULA CEREVIS'IE, or the YEAST-PLANT, is one of those fungi which are connected with the process of fermentation. The general history of this fungus will be noticed in the article YEAST, and we shall here only refer to the medicinal bearing of the subject. This plant, which is also known under the name of *saccharomyces*, *mycoderma cerevisiæ*, and *cryptococcus fermentum*, may be readily observed by examining a little yeast under the microscope, when it will be seen in the form of round or oval corpuscles

(cells), varying in diameter from the 800th to the 400th of a line, and many having smaller corpuscles in their interior. They grow by protrusion of gemmules, and germinate sometimes on one, and sometimes on several spots of the primitive fungus cells. These shoots throwing off new gemmules, the yeast-plant gradually forms single or branching rows of oblong cells, connected together like beads. This peculiar arrangement of the cells, and the fact that they are not acted on by acetic acid, is characteristic of the plant.

This fungus exists in the saccharine urine of *diabetes mellitus*, after it has been discharged for 24 hours or longer, and its appearance in urine within a day or two is sufficient to lead to the suspicion of the presence of sugar. It likewise is of not unfrequent occurrence in vomited matters and in fecal evacuations; and wherever it is found, it is indicative that the fluid is in a state of saccharine fermentation.

As fungi more or less closely resembling the yeast-plant often occur in non-saccharine urine that has stood for some days, the assumed presence of the *T. cerevisiæ* must not be taken as a proof of the presence of sugar, although it affords a strong hint for testing for that substance.

TO RUS, the convex member of the base of classic columns. See **COLUMN**.

TORY, a political designation taken, it is said, from savage Irish tribes, and originally applied to the followers of the duke of York, afterward James II. Johnson defined the tory as "one who adheres to the ancient constitution of the state and the apostolical hierarchy of the church of England." The present "conservative" party of England is the historical successor of the tories. In this country during the revolution the adherents of the crown were called tories. A curious local use of the word was that of the common people in some parts of the south during the civil war, applying it to irregular troops or "bushwhackers" claiming to be federalists.

TOSHACH (Celtic, captain), the name which was given among Celtic nations to the military leader of a clan or tribe, whose functions were in early times always separated from those of the supreme judicial officer. When the office of toshach, originally elective, became hereditary, according to the principle of divided authority characteristic of Celtic communities, it remained permanently in the eldest cadet of the clan. See **TANISTRY**.

TO TEM. The ruder races of men are found divided into tribes, each of which is usually named after some animal, vegetable, or thing which is an object of veneration or worship to the tribe. This animal, vegetable, or thing is the *totem* or *god* of the tribe. From the tribe being commonly named after its totem, the word is also frequently employed to signify merely the tribal name. Numerous tribes with totems exist in America, in Australia, the South Pacific islands, and in central Asia; and there are some reasons for thinking that such tribes were once numerous even in Europe among races belonging to what is called the Indo-European division of the human family.

Among the red Indians of America the following are totems of tribes existing or known to have existed: the wolf, bear, beaver, turtle, deer, snipe, heron, hawk, crane, duck, loon, turkey, musk-rat, sable, pike, cat-fish, sturgeon, carp, buffalo, elk, reindeer, eagle, hare, rabbit, and snake; the reed-grass, sand, water, rock, and tobacco-plant. Among the tribes of native Australians the totems are similarly, for the most part, selected from the fauna of the country. The totems of the Kirghiz tribes of central Asia are all of them animals, to which (in explanation of their reverence for them) the tribes trace back their descent.

It has been suggested that the explanation of the crests and emblems of the now disrupted tribes and clans of our own country, and of Europe generally, is to be found in the supposition that the creature or thing on the crest was originally the totem of the clan or tribe. On this supposition the wide-spread clan Chattan or Cattan, for instance, which is represented in the Scotch Highlands, and can be traced in France, Germany, and Egypt, would fall to be recognized as the *cat* tribe, the cat having once been its *totem*, as it is still its crest or emblem. It has also been thrown out that many of the mythical traditions of ancient Greece admit of a reasonable meaning, if we suppose that there were anciently in Greece tribes with *totems*—bull, boar, and lion tribes; snake, ant, and dragon tribes. These suggestions have not yet been put to the test of a thorough investigation; but so far as inquiry has gone, the results are in favor of the conclusions to which they point as to the early condition of human tribes all over the world. A single instance may be given of success in tracing back a totem to old times and in widely separated countries. There are numerous existing snake tribes both in America and the South Sea islands, and there is something like *proof* that the snake was the totem of very many and powerful ancient races. Its worship can be traced among Semitic races; there are traces of it in the traditions of the Pelasgi; there are proofs of it among the Celts; and the most magnificent ecclesiastical architecture in the world is that of the Nagas—the serpent-worshippers of Cambodia—still existing, and only recently brought to light. We may believe that, in the period of primitive animal-worship, when the serpent was a creature of so much importance, other animals also had their worshippers, and that snake-tribes were not the only tribes with animal totems in those times, any more than they are among existing primitive peoples.—See *Cambrian Journal*, vol. iii. 2d series, p. 149; *Grey's Journals*, vol. ii. chap. xi.; *Mitchell's Russians in Cen-*

tral Asia; Latham's *Descriptive Ethnology*; Sydenham's *Baal Durstrigensis*; and footnote to *Kinship in Ancient Greece*, by J. F. McLennan; *Fortnightly Review*, April 15 and May 1, 1866.

TOTIPALMÆ, Cuvier's name for a group of birds, of the order *palmipeds*, having the hind-toe connected with the other toes by a web. Pelicans, cormorants, frigate-birds, gannets, and darters belong to this group. All the totipalmæ are marine; they feed on fishes, mollusks, and other marine animals, and are excellent swimmers and divers. Many of them have long wings, and are birds of powerful flight.

TOTNES, or **TOTNESS**, a municipal borough and market-t. of Devonshire, pleasantly situated on the slope of a steep hill, on the right bank of the river Dart, about 10 m. from its mouth. It is a place of great antiquity, has an interesting church of the 15th c., and some curious antique houses; the ruined keep of the ancient castle, on the summit of the hill, is said to have been built by Joel de Totneis, a Norman baron, on whom the manor was bestowed at the conquest, and who founded here also a Cluniac priory. The river Dart is navigable for vessels of 200 tons up to the town, which is a place of some little shipping trade. The borough formerly returned two members to parliament, but was disfranchised for corrupt practices at elections by the reform bill of 1867. Steamers ply during the summer months between Totnes and Dartmouth. It is a station on the South Devon railway. Pop. '71, 4,073.

TOTTEN, JAMES, 1816-71; b. Penn.; graduate of West Point, 1841; an artillery officer in the Florida and Mexican wars. In the war of the rebellion he commanded the arsenal at Little Rock, Ark., when it was taken by the confederates; served as chief of artillery in Missouri under gens. Lyon and Fremont; and commanded a division under Halleck. He was at one time inspector-gen. of the department of Missouri, and subsequently of the department of the Atlantic; brevet maj.gen. of volunteers, 1865.

TOTTEN, JOSEPH GILBERT, 1788-1864; b. Conn.; graduated at West Point. During the war of 1812 he was chief engineer successively of the army under Van Rensselaer, Dearborn, Izard, and Macomb, and was brevetted lieut.col. for gallantry at Plattsburgh. As a member of the board of engineers he matured a plan for the defense of the coast and sea-ports. He supervised the construction of fort Adams, Newport, 1825-38. The latter year he became chief engineer, and col. of the corps of the engineers. During the Mexican war he had charge of the engineering operations at the siege of Vera Cruz in 1847, and was brevetted brig.gen. for his skillful conduct of the siege. In 1815 he made a model of an embrasure for casemated batteries. In 1830 he conducted a series of experiments to test the strength of different kinds of timber, and the expansion and contraction of building stone by changes of temperature. He made experiments, 1851-55 "on the effects of firing with heavy ordnance from casemate embrasures," the results which he reached have been guides in such constructions down to a recent period. He published in 1838 *Hydraulic and Common Mortars*.

TOUCAN, *Ramphastos*, a Linneæan genus of birds now forming the family *ramphastidae*, which belongs to the order *scansores*, and contains nearly forty known species, all natives of tropical America, and remarkable for the magnitude of the bill. They are divided into two groups, the true toucans (*ramphastos*), and the aracaris (q.v.) (*ptero-glossus*), of which the latter contains the greater number of species; the former has the largest bill, and the tail is shorter. There is a difference also in the prevalent colors, the aracaris generally exhibiting much green and yellow, while the true toucans have the ground color of the plumage usually black; the throat, breast, and rump often gayly adorned with white, yellow, and red. The colors, however, are not in general finely blended, but appear in strong contrast. The legs of toucans are short; the feet have two toes before and two behind. The form of the body is short and thick; the tail is rounded or even, varying in length in the different species from half the length to almost the whole length of the body, and is capable of being turned up over the body in a remarkable manner, which it always is when the bird is at roost. The neck is short and thick; the enormous bill is at the base of the full width and depth of the head, and is in some species more than half the length of the body. It is arched toward the tip, irregularly toothed along the margins of the mandibles, and extremely cellular and light, yet strong in structure. The tongue is very long, narrow, and singularly feathered on each side, the processes which give it this feathered appearance probably adding much to its sensibility as an organ of taste. When a toucan takes food between the points of the mandibles, the tongue is immediately applied to it, as if to test or enjoy it, and afterward it is tossed into the throat by a sudden throwing back of the head. Toucans may almost be described as omnivorous; they eat fruits with avidity, but they also seize and devour small birds. Their powerful bill enables them to kill a small bird by a single squeeze. They make a curious clattering noise with their great mandibles, and also emit at times a harsh cry. They live chiefly in the depths of the South American forests, in small flocks. They are easily tamed, and bear cold climates well. In captivity, they readily eat rice, bread, potatoes, eggs, and many other kinds of food. They are remarkable among birds for regurgitation of food, in order to a kind of mastication in the great bill, analogous to rumination in quadrupeds. The colors of the bill are, in most of the species, very brilliant dur-

ing life, but disappear from stuffed specimens in museums. The largest species, as *rampastos toco*, are about 27 in. in length, the bill in this species measuring $7\frac{1}{2}$ in., and the tail 10 inches.

TOUCH is the sense through which we take cognizance of the palpable properties of bodies. It is used in two senses. In its extended acceptation, it implies, says Dr. Carpenter, "our consciousness of *all* those sensory impressions which are neither olfactive, visual, auditory, nor gustative: and it is therefore designated as the *general sense*, in contradistinction to those which are considered as *special senses*. In its limited application, on the other hand, it is used to designate that modification of the general sensibility which is restricted to the tegumentary surface, or to some special portion of it, and which serves to excite definite ideas in our minds respecting the form, size, number, configuration, weight, temperature, hardness, softness, etc., of objects brought within its cognizance."—Article "Touch," in *Cyclopedia of Anatomy and Physiology*, vol. iv. p. 1163. In the article **SENSIBILITY**, we have briefly noticed touch in its general sense; and we shall here confine ourselves to the investigation of the sense of touch in its limited application, as exercised by the organs specially adapted for the reception of tactile impressions.

The special organs of touch are the papillæ, which are figured and very briefly noticed in the article **SKIN**. These papillæ are more elevated and numerous on the palmar surface of the ends of the fingers than on any other part of the skin (although they are still larger on the tongue). They have an average length in man of $\frac{1}{160}$ of an inch. Their surface, after the removal of the epidermis, appears, from the investigations of Todd and Bowman, to be composed of the basement membrane of the cutis itself; and their interior is composed of fibrous tissue, vessels, and nerves, as is seen in the figures of the lingual papillæ given in the article **TASTE, SENSE OF**. In each papilla is a small arterial twig, which, entering at the base, subdivides into capillary vessels, which form loops, whose convexity lies in the papillary summit. The vascularity of the papillæ is so great, that their presence and relative size may be determined simply by the depth of the color imparted to the skin by a good injection of its vessels. Hence, as a general rule, the vascularity of the integument is proportioned to its perfection as an organ of touch. With regard to the mode in which the nerves terminate, there is still considerable doubt. According to Todd and Bowman, it is often impossible to detect any nerves at all within the papillæ, when such were plainly visible at their base; and they incline to the belief, that the nervous tubules, either entirely, or in a great measure, lose the white substance when within the papillæ.

In the lower animals, as in man, the papillæ are especially developed in those parts of the outer surface which are especially endowed with tactile sensibility. For the following illustrations of this statement, drawn from comparative anatomy, we are indebted to Dr. Carpenter: "In the quadrumana generally, both the hands and feet are thickly set with papillæ, and in those which have a prehensile tail, the surface of this organ possesses them in abundance. In the carnivorous and herbivorous mammalia, whose extremities are furnished with claws, or encased in hoofs, we find the lips and the parts surrounding the nostrils to be the chief seat of tactile sensibility, and to be copiously furnished with papillæ; this is especially the case with those which have the lips or nostrils prolonged into a snout or proboscis—as in the pig, the rhinoceros, the tapir, and the elephant. In the mole, too, the papillary structure is remarkably developed at the extremity of the snout. The only part of the skin of birds on which tactile papillæ have been discovered is on the under surface of the toes, and on the web of the palmipeds, where they obviously receive impressions which guide the prehensile and other movements of the feet. In many lizards, a papillary structure is found on the under surface of the toes; and in the chameleon, it exists also on the integument of its prehensile tail. . . . In serpents and chelonians (tortoises), no papillary apparatus has as yet been detected; and in fishes and invertebrata, its presence has not been ascertained, although it would appear that certain parts, especially the tentacles around the mouth, are endowed with a high degree of tactile sensibility." *Op. cit.*, p. 1166. It is probable that in all animals which have a soft fleshy tongue furnished with papillæ, this organ is an instrument of tactile sensibility as well as the organ of taste. Besides the papillary apparatus, certain animals have special organs of touch, constructed on a totally different plan, and "consisting of a rod or filament, which is in itself insensible, but which is connected at its base with nervous fibers in such a manner that any motion or vibration communicated to it must be transmitted to them." The so-called "whiskers" of the cats and certain rodents, as the hare and rabbit, belong to this class; and it has been proved, experimentally, that if they be cut off, the animal loses, to a great extent, its power of guiding its movements in the dark.

Among the conditions necessary for the exercise of the sense of touch are (1) a normal condition of the papillary apparatus and of the nerves supplying it; (2) a due supply of blood to the tactile organs; and (3), as has been noticed in the article **TASTE**, a temperature not too far removed from the natural heat of the body. It has been shown by prof. Weber, that, if the fingers or the lips be immersed for half a minute or a minute in water heated to 125°, or cooled to 32°, the power of distinguishing between a hot or cold fluid or solid body is for the time completely lost, a feeling of pain alone being

experienced. The result was the same on applying cold to the trunk of a nerve, the ulnar nerve at the elbow, where it lies just beneath the skin, being selected for the experiment. The fingers supplied by this nerve soon lost the power of distinguishing between heat and cold, and could only imperfectly perceive the contact and pressure of bodies.

The above-named physiologist has made a large number of experiments on the general subject of touch. His investigations regarding the tactile discrimination in different parts of the skin have been noticed in the article SENSIBILITY. Prof. Valentin, whose results, on the whole, correspond very closely with those of Weber, found, however, a considerable extent of individual variation, some persons being able to distinguish the separate compass-points at half or even one-third of the distances required by others.

There is no sense which is so capable of improvement as that of touch. Of this power of improving the delicacy of touch, says Dr. Carpenter, "we have examples in the case of certain artisans, whose employments require them to cultivate their tactile discrimination; thus, the female silk-throwsters of Bengal are said to be able to distinguish by the touch alone *twenty* different degrees of fineness in the unwound cocoons, which are sorted accordingly; and the Indian muslin-weaver contrives by the delicacy of his touch to make the finest cambric in a loom of such simple construction that European fingers could at best propose to make a piece of canvas at it." The highest degree of tactile sensibility is met with in blind persons—a circumstance which is to be attributed for the most part to the concentration of the attention and of the powers of recollection and comparison which are brought to bear upon the mind; and probably to some extent to an increased development of the tactile organs themselves, resulting, as the above-named physiologist suggests, "from that augmented nutrition which would be the natural consequence of the frequent use of them, and of the increased flow of blood that seems to take place toward any part on which the attention is constantly fixed."—For much interesting information on this subject, the reader is referred to Dr. Kitto's *Lost Senses*, in which cases, apparently quite authentic, are given of blind persons being able to distinguish colors by the touch.

TOUCH-HOLE, or VENT. See GUN.

TOUCH-PAPER. See NITER.

TOUCH-STONE, a hard black stone, occasionally used in assaying. The best kind is a peculiar bituminous quartz obtained from Lydia, in Asia Minor; but black basalt may be employed. The process is as follows: A series of "needles" or small bars are formed, the first consisting of pure gold; the second, of 23 of gold and 1 of copper; the third, of 22 of gold and 2 of copper, and so on. The assayer selects one of these alloys, or "needles," which, from its color, he judges to approach nearest in composition to the alloy which he is about to assay. This he rubs on the stone, and the streak which it leaves is red in proportion to the copper that is present. The streak formed by the alloy to be assayed is then compared with that formed by the various "needles," and corresponding streaks indicate corresponding amounts of copper. Hence, an approximate estimate of the amount of copper in an alloy can be made.—See Miller's *Inorganic Chemistry*, 2d ed., p. 739, *note*.

TOUCH-WOOD is the wood of willows and some other trees softened by decay. It is used as tinder for obtaining fire, from the readiness with which a spark ignites it.

TOUL, a fortified t. of France, dep. of Meurthe-et-Moselle. On Sept. 23, 1870, this fortress surrendered to the Germans after a bombardment of three days' duration. It has an old cathedral, which took more than five centuries to finish (965–1496), and which is reckoned one of the most splendid in France. Cotton, woolen, lace, and faience manufactures are carried on. Pop. '76, 9,566.

TOULA, or TULA, one of the governments of Great Russia, bounded on the n. by the government of Moscow. Area, 11,909 sq.m.; pop. '70, 1,167,878. The surface is for the most part level; the climate is temperate; the soil fertile. The Oka is the only river which is navigable throughout the government, and the other streams are tributaries either of the Oka or the Don. The surface is in general dry, there being no lakes or marsh lands, and forests are rare. The inhabitants are occupied chiefly in agriculture, cattle-breeding, the manufacture of pottery, fishing, and the working of iron mines.

TOULA, or TULA, an important manufacturing t. of Great Russia, capital of the government of the same name, on the Upa, an affluent of the Oka, 110 m. s. of Moscow. Its 28 churches, its arsenal, theater, industrial museum, cathedral, and the ancient Kremlin are the principal buildings. Toul is an ancient town, and has suffered severely from Tartar invasion, and during the wars of the commencement of the 17th century. Iron-works founded here under czar Alexis Michailovitch have acquired a well-merited reputation. The Russian army is largely supplied with muskets and small-arms from the works of this town. Cutlery, locks, tea-urns, and bells are made in great perfection; and bristles are prepared in large quantities both for home consumption and export. Pop. '67, 58,150.

TOULMIN, JOSUA, D.D., 1740–1815; b. London; became pastor of a dissenting congregation in Colyton. In 1765 he accepted a call from a Baptist congregation in Taunton. He then became a Unitarian, and received the degree of D.D. from Harvard

college in 1794. In 1804 he became minister of a Unitarian congregation at Birmingham. He published *Memoirs of Faustus Socinus* (1777); *Dissertations on the Internal Evidences of Christianity* (1785); and a *Historical View of the State of the Protestant Dissenters in England* (1814).

TOULON, a great sea-port and naval arsenal of France, in the dep. of Var, stands on the shore of the Mediterranean, 37 m. s.e. of Marseilles, with which it is connected by railway. It stands at the head of a deeply penetrating inlet or gulf, rises in the form of an amphitheater toward the n., where its ramparts extend to the foot of a chain of lofty elevations, in part clothed with beautiful forests. The port is divided into two parts, the old and the new; the former, on the e., appropriated to merchant vessels, and bordered by a quay; the latter, on the w., surrounded by the dockyard, slips, arsenal, store-houses, cannon-foundry, etc. Numerous forts defend the town on the land-side; and the mouth of the harbor, and the hills commanding it, are studded with forts and redoubts; while moles, hollow and bomb proof, and formed externally into batteries, level with the water's edge, separate the roadstead from the old and new ports. Belonging to the arsenal, which is perhaps the finest in France, the chief objects of attraction are the sail-yard, the armory, the museum, the magazine, and the basin for the repair of ships. The fortifications of the town have been greatly extended since the conquest of Algeria, Toulon having become the chief port of communication with Africa. The population has also greatly increased, and two new suburbs have been constructed. The town is surrounded by a double rampart, and by a wide and deep fosse. The streets are straight and wide; and, on the whole, the town is both agreeable and healthy. The town is the Plymouth of France; and its industry consists, for the most part, of those manufactures to which its position as a great naval arsenal gives rise. Pop. '76, 61,382.

Toulon was destroyed by the Saracens in 889, and again by the Saracens about the close of the 12th century. It is only at the end of the 16th c. that Toulon comes to be important as a naval and military stronghold. It was taken by the English and Spaniards in 1793; but the allies were obliged to evacuate the town in December of the same year, after being fiercely attacked by the republicans, whose guns were commanded by Napoleon—then a simple officer of artillery—who here evinced for the first time his genius and self-reliance.

TOULOUSE (anc. *Tolosa*), an important city in the s. of France, capital of the dep. of the Haute-Garonne, is situated in a broad and pleasant plain, on the right bank of the river Garonne, 160 m. by railway s.e. of Bordeaux. Pop. '76, 120,208. The *canal du Midi* sweeps round its eastern and northern sides. The Garonne is here crossed by a beautiful bridge upward of 810 ft. in length, and 72 broad, which connects Toulouse with the suburb of St. Cyprien. The city, with the exception of the southern faubourg, is not particularly handsome (though the broad quays have rather an imposing appearance), and there are few fine public buildings. One may note, however, the cathedral, containing the tombs of the counts of Toulouse; the *capitole*, or town-hall; the church of St. Sernin (1090 A.D.); the musée, with its interesting collection of antiquities, forming an almost uninterrupted chain in the history of art, from the Gallo-Roman to the renaissance period. Toulouse is the seat of an archbishop, has a university academy, an academy of "floral games" (*société des jeux floraux*), pretending to derive its origin from the contests of the ancient troubadours, academies of arts, sciences, antiquities, etc., schools of law, and medicine, and artillery, a national college, an observatory, a museum, botanic garden, and a public library of 50,000 volumes. Toulouse manufactures woollens, silks, leather, cannon, steam-engines, tobacco, brandy, etc., and carries on a great trade with Spain. Its duck-liver and truffle pies are celebrated throughout the s. of France.

History.—*Tolosa* was, in Caesar's time, a city within the limits of the Roman *provincia*, and had been originally the capital of the Volce Tectosages, a Gallic tribe noted for its wealth and consequence. Under the empire its importance continued. Ausonius describes it as surrounded by a brick wall of great circuit, and so populous that it had founded four colonies. In 412 A.D. the Visigoths made it the capital of their kingdom; and after the time of Charlemagne, it was under the sway of counts, who made themselves independent about 920, but in 1271 the "county of Toulouse" was reunited to the crown of France by Philippe le Hardi. Its literary celebrity reaches as far back as the Roman empire. Ausonius speaks of the *toga docta* of "Palladian" Tolosa, and the favorite deities of the city were Jupiter, Minerva, and Apollo. At a little village close by, which still bears the name of *Viel Toulouse*, a multitude of cinerary urns, statuettes, Phœnician, Celtiberian, Gallic, Greek, and Roman medals, fragments of buildings, and an entire paved street have been discovered. Early in the middle ages, under the counts of Toulouse, it became a seat of provençal poetry, and was the center of the papal crusade against the Albigenses, conducted by Simon de Montfort. The parliament of Toulouse had also a great reputation, but unhappily it is likely to be best remembered by one of its most iniquitous decisions, that delivered in the case of the Calas (q.v.) family.

TOURAINE, one of the former provinces of France, of which the capital was Tours (q.v.), and which was bounded on the n. by the province of Orléannais, on the e. by Berri, on the s. by Poitou, and on the w. by Anjou. It was about 60 m. in length, and nearly the same number of miles in breadth, and it appears on the map now as the département of Indre-et-Loire.

TOURCOING, a frontier t. of France, dep. of Nord, $7\frac{1}{2}$ m. n.e. of Lille, is built on an eminence in the midst of a fertile territory. It has a great reputation for its manufacture of linen cloths, and also carries on sugar-refining, distilling, and manufactures of soap, colors, etc. Pop. '76, 33,013.

TOURGEE, ALBION WINEGAR, b. Ohio, 1838; educated at the university of Rochester, N. Y.; studied law; was in the army in the war of the rebellion, 1861-65; was twice wounded; practiced law at Greensboro', N. C., after the war; was a member of the convention of southern loyalists held in Philadelphia, 1866, and presented a report on the condition of the southern states; was made judge of the state superior court, 1868. He aided in preparing *A Code of Civil Procedure for North Carolina*, and has recently published three widely-circulated works—*The Fool's Errand*, *Bricks Without Straw*, and *Figs and Thistles*.

TOURMALINE, a mineral ranked among gems (q.v.), and occurring in primitive rocks in many parts of the world. Its chemical composition is very complex and somewhat various, but the chief constituents are always silica and alumina in about equal proportions, and forming about three-fourths of the whole; the remainder consisting of boracic acid, fluorine, phosphoric acid, peroxide of iron, peroxide of manganese, protoxide of iron, magnesia, lime, soda, potash, and lithia, which are not, however, all present in any specimen. Tourmaline is harder than quartz, but not so hard as topaz or emerald. Its specific gravity is a little more than 3. It occurs in crystals, or massive and disseminated, although always crystalline. Its luster is vitreous. Some varieties are transparent, some translucent, some opaque. Some are colorless, some green, brown, red, blue, and black. Red tourmaline is known as *rubellite*, blue tourmaline as *indicolite*, and black tourmaline as *schorl*. This last is the most common kind. Tourmaline crystallizes in prisms, with 3, 4, or 9 sides, variously acuminated. The sides of the prisms are striated. The finest tourmalines are much valued by jewelers, but are comparatively rare. They mostly come from Ceylon, Siberia, and Brazil. Tourmalines are found in several parts of Britain. Very large crystals abound in the granite of Aberdeenshire.

TOURNAMENT (Fr. *tournoi*, from *tournoyer*, to turn round), a military sport of the middle ages, in which combatants engaged one another with the object of exhibiting their courage, prowess, and skill in the use of arms. The invention of the tournament has been ascribed to Geoffroy de Preuilly, ancestor of the counts of Anjou, who lived in the 10th c.; France was its earliest *locale*, whence it spread first to Germany and England, and afterward to the s. of Europe. A tournament was usually held on the invitation of some prince, who sent a king-of-arms or herald through his own dominions and to foreign courts signifying his intention of holding a tournament and a clashing of swords in presence of ladies and damsels. The intending combatants hung up their armorial shields on the trees, tents, and pavilions around the arena for inspection, to show that they were worthy candidates for the honor of contending in the lists in respect of noble birth, military prowess, and unspotted character. The combat took place on horseback, or at least was always begun on horseback, though the combatants who had been dismounted frequently continued it on foot. The usual arms were blunted lances or swords; but the ordinary arms of warfare, called arms *à l'outrance* were sometimes used by cavaliers who were ambitious of special distinction. Tournaments were the subject of minute regulations, which in some degree diminished their danger. The prize was bestowed by the lady of the tournament on the knight to whom it had been adjudged, he reverently approaching her, and saluting her and her two attendants. The period when tournaments were most in vogue comprised the 12th, 13th, and 14th centuries; and the place where the most celebrated English tournaments were held was the tilt-yard, near St. James's, Smithfield, London. The church at first discountenanced tournaments, some of its decrees prohibiting persons from engaging in them under pain of excommunication, and denying Christian burial to a combatant who lost his life in one. The church seems, however, to have looked with more favor on these combats after the middle of the 12th century. During the 15th and 16th centuries, tournaments continued to be held, but the alteration in the social life and warfare of Europe had changed their character, and they are rather to be regarded as state pageants than as real combats. The death of Henry II. of France, in 1559, consequent on the loss of his eye at a tournament, led to their general abandonment, both in France and elsewhere, and there have been few attempts to revive them even as mere spectacles. A magnificent entertainment, consisting of a representation of the old tournament, was given at Eglinton castle in 1839, by the late earl of Eglinton: lady Seymour was the queen of beauty, and many of the visitors enacted the part of ancient knights; among them prince Louis Bonaparte, afterward Napoleon III.—According to Ducange, the difference between a tournament and a *Joust* is that the latter is a single combat, while in the former a troop of combatants encounter each other on either side. But this distinction has not been always observed.

TOURNAY (Flemish, *Doornik*), a fortified t. of Belgium, province of Hainault, on both sides of the Scheldt, near the French frontier. It has a splendid cathedral with five towers (and pictures by Jordaens, Rubens, Gallait, etc.), several fine churches, particularly St. Quentin and St. Jacques, a gallery of art, an episcopal seminary, five hos-

pitals, and a lunatic asylum. Although one of the oldest towns in Belgium, it has quite a modern appearance, with fine suburbs and beautiful broad streets. The chief manufactures are hosiery, linen, carpets, and porcelain; but there are few large workshops, most of the fabrics being executed by the people in their own houses. Pop. '75, 32,184. A little to the s.e. lies the famous village of Fontenoy (q.v.).

Tournay, the ancient *Tornacum* or *Turris Nerviorum* ("fort of the Nervii"), was in the 5th and beginning of the 6th c. the seat of the Merovingian kings, subsequently belonged to France, but at the peace of Madrid was included in the Spanish Netherlands. Subsequently, it was oftener than once taken by France, but again restored by treaty. During the month of May, 1794, it was the scene of several hotly contested fights between the French and Austro-English armies, the most important of which was that of May 19, in which Pichegru beat the duke of York.

TOURNEFORT, JOSEPH PITTON DE, one of the greatest botanists of the 17th c., b. at Aix, in Provence, in 1656. He exhibited an ardent love of botany from his youth, and devoted his whole life to this science. After having explored the flora of his native district, he was sent, at the king's expense, to Spain, Portugal, England, and Holland, and afterward to the east. He visited the Grecian archipelago and Thrace, the shores of the Black sea, and Asia Minor, and added a great number of species to the list of known plants. He lost his life in 1708, in consequence of a carriage running against him in Paris. He published several botanical works, and a *Voyage to the Levant*. His botanical system, which maintained its ground till the time of Linnaeus, was of great use in promoting the progress of botany; but he rendered still greater service to his favorite science by grouping plants in genera. He was the first to do so. Previous botanists had merely described them individually, as species.

TOURNIQUET, an instrument for compressing the main artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or to check dangerous hemorrhage from accidental wounds, or to stop the circulation through an aneurism.

The common tourniquet consists of three parts—viz., (1) a pad to compress the artery; (2) a strong band which is buckled round the limb; and (3) a bridge-like contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band. The best kind of pad is a small firm roller about an inch thick; it must be placed lengthways over the main artery so as to compress it against the bone, and must be secured in its place by a turn of bandage, over which the band of the tourniquet must be applied. This band must first be tightly buckled, and the pressure must be then increased to the necessary extent (namely, till the beating of the artery beyond the instrument ceases to be perceptible) by the action of the screw, which should always be opposite the buckle of the band. As the instrument arrests the venous blood, it should never be applied tightly in cases of amputation, until the surgeon is ready to make his incision, as otherwise there would be an excessive loss of venous blood.

The credit of the invention of this most useful instrument is usually ascribed to the French surgeon, Morel, who, in 1674, used a stick passed beneath a fillet, and turned round so as to twist it up to the requisite degree of tightness, as a means of preventing the undue loss of arterial blood in amputations of the limbs—a rough, but by no means ineffectual form of tourniquet, which may often be usefully extemporized in cases of emergency at the present time. Mr. Young, of Plymouth, in 1679, described a similar apparatus. A much improved screw tourniquet was invented by Petit early in the following century.

TOURO, JUDAH, 1775-1854; b. Newport, R. I.; son of Isaac Touro, rabbi of the synagogue at Newport (1762), who emigrated from Holland. He went to the Mediterranean in 1798 as supercargo in his uncle's vessel, which on its passage had an engagement with a French privateer and gained the victory after a desperate battle. On his return he resided some time in Boston; removed to New Orleans, 1802, amassing a large fortune in trade, which he used beneficently, bequeathing much of it to public institutions in that city. The Touro almshouse, one of his gifts, used as barracks for colored troops during the rebellion, was destroyed by fire. He was wounded in the hip at the battle of New Orleans, 1815, and never recovered from the ill effects. He was an Israelite, but gave liberally in money and land to other denominations and their enterprises. He gave \$10,000 to the Bunker hill monument association.

TOUROUKCHANSK, a small t. of e. Siberia, in the government of Yeneseisk, stands on the Yenesei, 4,122 m. e. of St. Petersburg, and only 50 m. s. of the arctic circle. Pop., '67, 286, who trade in furs.

TOURS, a city of France, capital of the dep. of Indre-et-Loire, and formerly capital of Touraine, stands in the midst of a fertile but flat valley, 146 m. s.w. of Paris. Along its n. side runs the Loire, and along its s. side the Cher—these two rivers uniting about 25 m. s.w. of the city, between which and their point of confluence only a very narrow strip of land separates them. The bridge over the Loire, which continues the great highway from Paris s. to Bordeaux, is upward of 1400 ft. long. The cathedral is a stately Gothic edifice. Surrounding the choir—begun in 1170—there is beautiful old

painted glass. The Tour de St. Martin or d'Horloge, and the Tour de Charlemagne, are noteworthy as being the only remains of the cathedral founded by St. Martin in the 4th century. The church was pillaged by the Huguenots, and utterly destroyed, with the exception of the two towers mentioned, at the revolution. Tours has a town hall and a museum. A little to the w. of Tours are the remains of Plessis les Tours, in which Louis XI. died in 1483. Manufactures of silk stuffs, carpets, painted glass, and pottery are carried on. Pop., 76, 48,325.

Tours, the ancient *Cæsarodunum*, dates from the time of the Gauls, and was visited by Caesar and by Adrian. Here Clovis, having come to thank St. Martin for the victory of Vouillé, received the crown of gold and the purple robe presented to him by the emperor Anastasius. Henry IV. planted the first mulberry-trees known in France here, and here the first silk-factories were established. Under Richelieu, 40,000 hands were employed at Tours, in this branch of manufacture; but the industry of the town was ruined by the revocation of the edict of Nantes. In the Franco-German war of 1870-71, Tours was for a time the seat of the French provisional government, and was occupied by the German troops.

TOURVILLE, ANNE HILARION DE COTENTIN, Count de, third son of César de Cotentin, seigneur de Tourville, was born at Tourville in 1642. Entering the French navy when, about eighteen, it seems that his somewhat delicate and effeminate appearance caused him to be regarded as anything but a hopeful seaman. He became, however, almost immediately conspicuous for bravery and enterprise; and the first six years of his naval service, directed against the Turks and Algerians, established his reputation both in France and in the south of Europe. In 1667, he was received at Versailles with great distinction by Louis XIV. In 1669, he distinguished himself in the expedition sent by France to the relief of Candia, then besieged by the Turks; and again in 1671-1672, in the naval war waged by the combined fleets of France and England against the Dutch. In 1682, he was made lieutenant of the navy, and for the following two or three years he was engaged in suppressing the pirates of Algiers and Tripoli. In the war which broke out after the English revolution of 1688, between France on the one part, and England and Holland on the other, Tourville was put at the head of the French navy. In June 1690, he entered the English channel at the head of a powerful fleet, and inflicted a disastrous and ignominious defeat on the united English and Dutch armament near Beachy Head. "There has scarcely ever been so sad a day in London," says Macaulay, "as that on which the news of the battle of Beachy Head arrived." Tourville ranged the channel unopposed; and on July 22, his fleet cast anchor in Torbay (see Macaulay, *History of England*, vol. iii. p. 652-54, ed. 1855). In 1692, Louis XIV. having resolved to invade England on behalf of James II., an immense fleet was assembled at Brest under Tourville in order to protect the descent. On the 16th May of this year the French fleet was descried from the cliffs of Portland, and on the following morning the English and Dutch force stood out to give battle. From the morning of the 19th to the afternoon of the 24th, raged one of the greatest naval battles of modern times that of cepe La Hogue. It ended in the complete defeat of the French, 16 of their men-of-war being utterly destroyed. In spite of this disaster, Tourville was graciously received at Versailles: "We have been beaten," said Louis to him, "but your honor and that of the nation are unsullied" (see *Memoirs of St. Simon*). On March 27, 1693, Tourville was made a marshal of France. Sailing from Brest harbor in the spring of this year, he attacked an English merchant fleet under inadequate convoy, and succeeded in inflicting a damage on English traders estimated at some millions sterling. Sir George Rooke, who commanded the convoy, had some difficulty in saving his own squadron from destruction. This was the last exploit of the great French admiral; his career ending with the peace of Ryswick in 1697. He died at Paris, May 28, 1701. It has been said of Tourville that he was competent to fill any place on board ship, from that of carpenter to that of admiral. It has also been said of him, that to the dauntless courage of a sailor he united the suavity and urbanity of an accomplished gentleman. But though a brave man, he was, during the earlier part of his career, a timid commander. Reckless of his life, he was often pusillanimously cautious where his professional reputation was at stake. Latterly, stung by the censures drawn on him by his natural disposition, he became bold even to rashness.

TOUS-LES-MOIS, a starch made in the West Indies, from the roots of a species of *Cauma* (see INDIAN SHOT); it is used as a substitute for arrow-root.

TOUSSAINT, ANNA LOUISA GERTRUDE, one of the most popular living Dutch novelists, was b. at Alkmaar, Sept. 16, 1812, where her father, a highly esteemed lecturer on chemistry, died in 1859. After the revocation of the edict of Nantes, her paternal ancestors fled from France, and took refuge, first at Hanau, and later in Friesland, where they ranked among the nobility, but were reduced in circumstances during the French usurpation. By the mother's side, she is also of a refugee family of the name of Roquette, belonging to the higher class of merchants and manufacturers. Her first work, *Almagro*, published in 1837, was well received, and translated into German. Speedily followed *De Graaf van Davonshire*, an episode in the early life of Elizabeth Tudor; then *De Engelschen te Rome*, a historical novel of the times of pope Sixtus V.; in 1840, the *Huis Laurenessé*, a story of the reformation, which has gone through several

editions, and been translated into German and English. Her popularity was increased by a series of novels in 10 volumes, 1845-55, under the titles of *De Graaf van Leycester in Nederland* (The Earl of Leicester in the Netherlands), *De Vrouwen van het Leycestersche tijdperk* (The Women of the Times of Leicester), and *Gideon Florentz*. Her other works are numerous, including *Cardinal Ximenes*, *The Duke of Alba in Spain*, *The Princess Orsini*, *De Mauléon*, *Don Abbondio II.*, *Mother-joy and Mother-grief*, *The Orphan of Alkmaar*, *The Leyden Student* in 1593, *The Biography of the Landscape Painter Maria van Oosterveldt*, etc. Her last work appeared in 1865, in a magazine called *The Guide*, and next year came out in 2 vols. In 1845 the magistrates of Alkmaar gave her a handsome present, as a token of the high regard of her fellow-citizens. In 1851 she married Johannes Bosboom, a distinguished painter, and has since resided at the Hague. Besides other honors, her husband obtained the gold medal at Brussels in 1842, and for paintings of churches, the large gold medal at the Paris exhibition in 1855.

TOUSSAINT, FRANÇOIS DOMINIQUE, surnamed L'OUVRETURE, was b. at Buda, in St. Domingo in 1743. His father and mother were both African slaves. When the French revolution broke out, it found him in the position of coachman to a M. de Libertat, who appears also to have employed him as a sort of sub-manager of an estate for which he was himself the factor. In 1791 the French convention passed the memorable decree, by which the rights of French citizens were given to people of color. In the revolutionary strife which followed in St. Domingo, Toussaint was, for the next three years, conspicuous for his adherence to the cause of royalty and Catholicism; but the decree of Feb. 4, 1794, which declared all slaves free, won him over to the side of the French republic. He joined their commander, Laveaux, by whom he was made a gen. of division. In 1793, in the midst of the troubles, the British had landed a force and taken partial possession of the island. Against them Toussaint now proved himself an able and indefatigable enemy, bringing the whole of the northern division of the island under the dominion of the French republic. In 1795, in consequence of a conspiracy of three mulatto generals, Laveaux was arrested at Cape Town; but Toussaint, assembling his negroes, and uniting himself to the French force, quickly effected the release of the governor. The gratitude of Laveaux was very great; and, in 1776, the commissioners of the directory appointed Toussaint chief of the army of St. Domingo. Shortly after this event, gen. Maitland, the British commander, surrendered to him all the strong places which he had hitherto held in the island. This was followed in 1801 by the submission of the Spanish forts. The whole of St. Domingo was then under the rule of Toussaint. His sway was vigorous and upright; and the agriculture and trade of the island both flourished under him. He was now at the summit of his prosperity. He assumed great state, though still retaining habits of personal simplicity. But a more powerful despot now found himself at leisure to interfere in the affairs of the island. During the peace of Amiens, Napoleon Bonaparte issued a proclamation re-establishing slavery in St. Domingo. This was met by a counter-proclamation by Toussaint, issued on Dec. 18, 1801, in which, while professing obedience, he showed plainly that he meant resistance. A squadron of 54 sail of the line, under gen. Le Clerc, very soon made its appearance to enforce the edict of the first consul. Toussaint was obliged to retire, was proclaimed an outlaw, and, agreeing to surrender, was received with military honors. He was afterward treacherously arrested, and sent to Paris, where, after 10 months of rigorous imprisonment, he died on April 27, 1803.—See *Vie de Toussaint l'Ouverture* by St. Remy (Par., 1850); and *The Life of Toussaint*, by Dr. Beard (Lond., 1853).

TOWER HAMLETS, a parliamentary borough in Middlesex, lying in the e. of London, and having the city and Finsbury to the w. of it. It contains the parish of St. George-in-the-East, the hamlet of Mile-End Old Town, the unions of Poplar, Stepney, and Whitechapel, and the tower of London. In Tower Hamlets are the mint, Trinity house, St. Katharine's docks, the East and West India, South and London docks, the London hospital, and various charitable institutions. The Tower Hamlets send two representatives to parliament. Pop. of borough '71, 391,790.

TOWER, ZEALOUS BATES, b. Boston, 1819; appointed to the engineers in the U. S. army in 1842, after graduating at West Point, where he was for a time assistant prof. of engineering. He served through the Mexican war, receiving several brevets for his conduct at Cerro Gordo, Contreras, Churubusco, and Chapultepec. At the beginning of the rebellion he was chief engineer at fort Pickens, Florida. He served in the campaign in northern Virginia in 1862, and was wounded in the second battle of Bull Run, where he commanded a brigade. He was chief engineer of the fortifications of Nashville, Tenn., 1864-65; and took part in the battle of Nashville. He was brevetted maj.gen. in 1865.

TOWER OF LONDON, in feudal days, a powerful fortress; then, and long after, a state prison of gloomy memories; now, a government storehouse and armory, and still, in some sense, a stronghold, is an irregular quadrilateral collection of buildings on rising ground adjoining the Thames, and immediately to the e. of the city of London. The space occupied is between 12 and 13 acres, and the whole is surrounded by a moat of fair width, but no great depth. Usually the moat is dry, but the garrison have the power of flooding it. Seen from without, the moat is bordered within by a lofty castellated wall, broken by massive flanking towers at frequent intervals. Within this wall

risers a second of similar construction, but greater height; and within this, again, are the several barracks, armories, etc.; and in the center of all, the lofty keep or donjon known as the white tower. This last, which nearly resembles Rochester castle, and like it, was built by Gundulph, bishop of Rochester, in the time of William the conqueror, is the center of interest and antiquity in the whole structure. Its walls are in parts 16 ft. thick, and of solid masonry. This tower was the court of the Plantagenet kings. The various other towers are principally noteworthy on account of the illustrious prisoners who have pined in them, or left them for the scaffold. In the n.w. corner of the quadrangle is St. Peter's chapel, now the garrison church. In another part is the jewel-house, containing the crown jewels, or *regalia*, comprising several crowns, scepters, globes, and jewels of enormous value. Near this building is the horse-armory a collection of ancient and mediæval arms and armor, the latter being exhibited in complete suits on wooden figures of men and horses. To the crown jewels and the armory, visitors are admitted on payment of a small fee.

Early writers have alleged that Julius Cæsar first built the tower of London as a Roman fortress; but there is no written evidence to prove the existence of any fortress on this site before the construction of the white tower by bishop Gundulph in 1078. Some earlier structure of the Saxon times appears to have been there, from the massive foundations which have been discovered in the course of subsequent erections; but of the nature of those buildings we know nothing. During the reigns of the first two Norman kings, the tower seems to have been used as a fortress merely. In Henry I.'s time, it was already a state prison. That monarch and his successors gradually increased the size and strength of the ramparts and towers, until the whole became a stronghold of the first class for feudal times. The kings frequently resided there, holding their courts, and not unfrequently sustaining sieges and blockades from their rebellious subjects. Of the long list of executions for political offenses, real or imputed, that of lords Kilmarnock, Balmerino, and Lovat, after the rebellion of 1745, was the last. Wilkes, Horne Tooke, and others have since been confined there; but happily, blood has ceased to flow since the existence of a living opposition has been found consistent with the safety of the government.

Not the least interesting memorials are the quaint and touching inscriptions cut by hapless prisoners on the walls of their dungeons.

In 1841 a very serious fire broke out in the bowyer tower, and extended to the armories, causing the destruction of numerous modern buildings and many thousand stand-of-arms. At present, the tower of London is a great military storehouse in charge of the war department, containing arms and accouterments for the complete equipment of a large army. The mint and public records were formerly kept in it, but have now been removed to other buildings more suitable. Flamsteed, when first appointed astronomer-royal, made his observations from the summit of the white tower; afterward, he removed to Greenwich. It is needless to say that, viewed as a fortress, the tower would be useless against modern arms.

The government is vested in a constable, who has great privileges, and is usually a military officer of long service and distinguished mark; the deputy-constable, also a general officer of repute, is the actual governor. He has a small staff under him, and the corps of yeomen of the guard, more commonly known as beef-eaters. In addition, a wing, and occasionally a battalion, of infantry is quartered in the barracks.—Bayley's *History of the Tower of London*, 2 vols. 4to; *Memoirs of the Tower*, by Britton and Brayley (1831); *Memorials of the Tower of London*, by Lord De Ros (1866); *Her Majesty's Tower*, by Hepworth Dixon, 4 vols. (1871).

TOWLE, GEORGE MAKEPEACE, b. Washington, D. C., 1840; educated at Boston public schools, the academies of Lawrence, Groton, and Wrentham, Mass., and Yale college; graduated, 1861; Harvard law school, 1863. He was admitted to the bar and practiced law in Boston, 1863-65. In 1865-66 he was on the editorial staff of the *Boston Post*; U. S. consul at Nantes, France, 1866-68; at Bradford, England, 1868-70. Returning to this country, he became managing editor for one year of the *Boston Commercial Bulletin*. In 1871-76 he was foreign editor of the *Post*, and has since been on the regular staff of *Appleton's Journal*, the *Art Journal*, and the *Youth's Companion*. He began his literary work by writing essays for the *North American Review*. Among his later publications are *The Principalities of the Danube, Modern Greece, Montenegro and Bulgaria* (1877). He edited Harvey's *Reminiscences of Webster* in the same year, and published *Vasca da Gama* (1878). He resides in Brookline, Mass., and is a constant contributor to the press and periodical literature.

TOWN, in law, a term of somewhat varying signification. In ancient times a wall seems to have been necessary to constitute a town, and the Anglo-Saxon word *tun*, from which *town* is derived, came from a verb meaning to inclose. This suffix *tun* is found with very many names of places. In Pennsylvania and some other states the word town may mean either a city or village. In New York and Wisconsin the town is a subdivision of the county, and so in most of the western states, though the name township is more commonly used. In the New England states the town has a distinctly different position, and is a political division of the state—the unit of civil organization, and, legally speaking, a *quasi* corporation. See MUNICIPALITIES—MUNICIPAL CORPORA-

TIONS (ante). Town governments cover all organized New England territory except that occupied by incorporated cities; and, with the exception of Massachusetts and Maine, the towns are the basis of legislative representation. Thus in Connecticut, the town of New Haven, pop. 62,822, and the town of Wolcott, pop. 493, have the same number of representatives in the lower branch of the legislature. The town officers (usually a town clerk, selectmen, a treasurer, assessors, poor overseers, school committee, and constables) are elected by the "town meeting," which also lays the taxes, and in other ways legislates for the town. This peculiarly democratic institution has fallen into a mere form in the larger towns, where there is usually a city charter. A curious assertion of its legal existence has recently (1881) occurred in Boston. The city charter of 1522 requires the common council to call a town meeting when requested so to do by, we believe, 40 respectable persons. Such petition was made by members of a "labor reform" society, and on refusal of the authorities to call the meeting, an order was obtained calling upon the "City of Boston" to come into court and show cause why a *mandamus* should not issue to compel the city to obey its charter. *order*

TOWN-ADJUTANT, TOWN-MAJOR, officers on the staff of a garrison. They are often veteran officers, too much worn for field-service. The pay depends on the magnitude of the trust. The town-major ranks as a captain, the adjutant as a lieutenant. The duties of these officers consist in maintaining discipline, and looking after the finding of the batteries, etc.

TOWN-CLERK is the clerk to a municipal corporation, elected by the town council. In England, he holds his office during pleasure, and his salary is paid out of the borough funds. His duties are: to take charge of the voting papers in the election of councilors, to keep the records of the borough and lists of burgesses, and to perform a variety of miscellaneous duties imposed by sundry acts of parliament.—In Scotland, he holds his office *ad vitam aut culpam*, is the advisor of the magistrates and council in the discharge of their judicial and administrative functions, attends their meetings, records their proceedings, is the proper custodian of the records of the burgh, and keeper of the registers of sasines and deeds within it. Various important statutory duties are also assigned to him in relation to the registration of voters, the conduct of municipal elections, the valuation of lands and heritages, the registration of births, marriages, and deaths, the licensing of public houses, etc. In the performance of a large proportion of these duties, he is independent of the town-council, who cannot make his appointment during pleasure, or attach to it any condition which might enable the council either to control him in the conduct of the business of his office, or withdraw from him any portion of his emoluments, so far as derived from fees. Being thus protected in the independent and impartial discharge of his functions as a public officer, he is bound to give extracts from the records in his custody without reference to the town-council, and is liable *personally* for the consequences of failure in any department of his duty. He is not, however, a magistrate in any sense, and cannot be held responsible for the obligations of the burgh, or for the omissions or neglect of the magistrates and council.

TOWN-COUNCIL is the governing body in a municipal corporation, elected by the rate-payers. The town-council administers the affairs of the borough in relation to its common property and to a variety of other matters, appointing the several officers required for this purpose. It is also charged with important functions in regard to police and sanitary matters; and the tendency of recent legislation is to concentrate in the council all matters of local administration. For the more effectual government of the community under its jurisdiction, the council is empowered to make by-laws, like local statutes, so far as not inconsistent with common law or public statute, or the constitution of the borough. One-third of the council go out of office every year, but are eligible for re-election at the annual elections in November. In all the corporate or borough towns of England (except London and a few other places specially excluded from the municipal corporation act, 5 and 6 Will. IV. c. 76) the town-council consists of the mayor, aldermen, and councilors. The councilors vary in number from 12 to 64, according to the population of the town; and one-third of the number are aldermen. Every burgess who is enrolled in the burgess-roll—i.e., every inhabitant householder (who has been for one year in respect of property, rated to the poor) in the borough, or within seven miles of the borough—is entitled to vote in the election. See **BURGESS**. The council elects the mayor, who continues in office for one year. The aldermen are elected from the councilors, or from persons qualified to be councilors. In the larger boroughs a person is not qualified to be a councilor unless he is worth £1000, or is rated for the support of the poor to the extent of £30 and upward; but in the smaller boroughs, he is qualified if worth £500, or rated for the poor at £15.—In Scotland, the town-council consists of the provost (in burghs which have a provost), bailies, treasurer, and common councilors, with the addition in Aberdeen, Dundee, and Perth, of the dean of guild, and in Edinburgh and Glasgow, of the dean of guild and convener of the trades. The election of councilors is regulated by 3 and 4 Will. IV. c. 76, and other acts mentioned below, under which every person who possesses the qualification requisite for voting in the election of the member of parliament, and who has resided for six months previous to June 30 in or within seven miles of the royalty, is entitled to vote in the election of councilors. The persons entitled to

be registered as parliamentary electors in burghs, are those who are of full age, and not subject to any legal incapacity, and have been for not less than twelve calendar months next preceding the last day of July, inhabitant occupiers, as owners or tenants, of any dwelling house within the borough, and have paid before June 20 all poor rates up to May 15; also lodgers occupying lodgings worth ten pounds. But no person can vote who is in receipt of poor relief, or is merely a joint occupier of a dwelling house. Every elector residing or carrying on business within the royalty is eligible as a councillor; and in burghs where burgesses exist, the person elected is made a Burgess before induction. The number of councillors varies in different burghs. The larger burghs are divided into wards or districts, each of which elects its proportion of councillors, as the smaller burghs do the whole council. The provost (in burghs which have a provost), bailies, treasurer, and other office-bearers fixed by the set or usage of each burgh, are elected by the councillors, the provost and treasurer holding office for three years, and the other office-bearers for the unexpired period of their councillorship. Vacancies in the magistracy or council are filled up *ad interim* by the remaining members of council—the person so elected retiring at the succeeding annual election. In burghs returning members to parliament, and all royal burghs, the election of members of council is regulated by 3 and 4 Will. IV. c. 76, 31 and 32 Vict. c. 103, 33 and 34 Vict. c. 92, and the ballot act (1872), 35 and 36 Vict. c. 33. In those more ancient royal burghs which, on account of the smallness of the population, were exempted from the provisions of the 3 and 4 Will. IV. c. 76, the election of magistrates and councillors is conducted according to ancient practice.

Previous to the municipal reform acts in the reign of William IV., town-councils were generally close corporations; the members elected their successors; business was conducted in private; and corrupt practices, with a variety of other abuses, prevailed. The ballot act, 1872, which applies to England, Scotland, and Ireland, leaving, however, some slight variations in each kingdom, extended to contested municipal elections nearly all the enactments relating to the poll at parliamentary elections. In England the mayor is the returning officer, who is to provide everything required for the purpose of a poll. The ballot (q.v.) is the means provided for taking the poll, and minute directions are contained in the act for the carrying out this practice. In Scotland all municipal elections were directed by the ballot act (1872) to be conducted in the same manner in all respects as under the practice applicable to the royal burghs mentioned in Schedule C of the act 3 and 4 Will. IV. c. 76—namely, Edinburgh, Glasgow, Aberdeen, Dundee, Perth, Dumfermline, Dumfries, and Inverness. Subject to this enactment, the poll at a contested municipal election is to be taken as in England. In Ireland the same act directs that the provisions at the English municipal elections act (1859) shall apply in relation to the nominations at Irish municipal elections; but in other respects the practice in taking the poll at a contested municipal election is to be the same as in England. Corrupt practices at municipal elections in England and Ireland are now inquired into by means of an election court presided over by a barrister, 35 and 36 Vict. c. 60. In England town-councils may, at the expense of the borough and local funds, promote and oppose bills in parliament for the public benefit, when sanctioned by special meetings, 35 and 36 Vict. c. 91.

TOWNE SCIENTIFIC SCHOOL. See UNIVERSITY OF PENNSYLVANIA.

TOWNLEY, CHARLES, 1737-1805; b. England; educated on the continent. He lived in Rome, 1765-72, and bought a large collection of antique statues, coins, bronzes, marbles, and manuscripts. In the purchase of antiques he was able to utilize the taste and knowledge of Winckelmann and other connoisseurs. After his return to England he continued to add to his collection, which is now in the British museum.

TOWNS, a co. in n.e. Georgia, adjoining North Carolina; drained by the Hiawasse river; about 200 sq.m.; pop. '80, 3,261—3,261 of American birth; 101 colored. The surface is rugged and mountainous; there are extensive forests; corn, oats, and pork are the chief products. Co. seat, Hiawassee.

TOWNSEND, EDWARD DAVIS; b. Boston, 1817; son of David S., who lost a leg in the war of 1812, and whose father Dr. David, 1753-1829, was an army surgeon in the revolutionary war. His maternal grandfather was Elbridge Gerry, one of the signers of the declaration of independence. He was educated at the Boston Latin school, and at West Point, graduating from the latter in 1837. He served in the Florida and Cherokee wars; chief of staff to gen. Scott, 1861. He was placed in charge of the war department, 1863, and took charge of the rehoisting of the flag over fort Sumter, 1865; brev. maj.gen., 1865; adj.gen., with rank of brig.gen., 1869.

TOWNSEND, GEORGE ALFRED; b. Del., 1841; educated in Philadelphia. He was connected with the *Inquirer* and *Press* of Philadelphia, and during the war sent to the New York *Herald* a series of letters, describing the Peninsular campaign. The closing events of the war were reported by him in interesting letters to the New York *World*. After the war he traveled in Europe; wrote for English papers, and was correspondent of several in this country. On his return he acted as Washington correspondent for several papers under the pseudonym, *Guth*; was connected with the Chicago *Tribune* for some years, and now resides in New York, still in newspaper work. He has published

collected correspondence; a volume of poems; *Lost Abroad*, a novel; and, recently, a volume of stories of Maryland life.

TOWNSEND, LUTHER TRACY, D.D.; born Me., 1838; graduated Dartmouth, 1859, and Andover theological seminary, 1862; professor of practical theology in the Boston university (Meth. Episcopal). He has published *True and Pretended Christianity*; *Credo*; *Sword and Garment*; *God-Man*; *The Arena and the Throne*; *Lost Forever*; *Outlines of Theology*; *The Chinese Problem*.

TOWNSHEND, CHARLES, VISCOUNT TOWNSHEND, English statesman, b. 1676: was descended from a very ancient English family, which has been settled at Raynham, in Norfolk, since the reign of Henry I. His father, Horatio, had been a prominent member of the Presbyterian party before the restoration, and having been one of the most forward in restoring the monarchy, was, by Charles II., made baron in 1661, and viscount in 1682. He died in 1687, when his son was only eleven years old. When he was of age to take his seat in the upper house, he adopted his father's politics; but soon afterward became a disciple of lord Somers, and cordially co-operated with the whigs. He was named by the Godolphin administration one of the commissioners for arranging the union with Scotland, and was rewarded for his exertion by the captaincy of the yeomen of queen Anne's guard. He was then employed as a diplomatist; was joint-plenipotentiary with Marlborough at Gertruydenberg; and negotiated with the states-general the barrier treaty, which pledged the states-general to the Hanoverian succession, and England to procure the Spanish Low Countries for the United Provinces, as a barrier against France. In 1712, upon the formation of the Harley ministry, Townshend was dismissed from his places, and the barrier treaty was censured by the house of commons, which voted that Townshend and all who had been concerned in the treaty were enemies to the queen and kingdom. This persecution raised him from the rank of a follower to the station of a leader. He maintained a close correspondence with the court of Hanover, and obtained the entire confidence of George I., who on his accession to the throne of England, made him his chief minister. While George I. was still at the Hague, on his way to his new kingdom, he made Townshend secretary of state, with power to name his colleague. He selected general, afterward earl Stanhope, and formed a ministry entirely whig in its party character. He strengthened it by the addition of Walpole, who, from being at first paymaster of the forces, was soon made chancellor of the exchequer and first lord of the treasury. The principal act of the government was the passing of the septennial bill, a bold and unconstitutional act. After the breaking up of the South Sea bubble, and the deaths of Sunderland and Stanhope (q. v.), Townshend (1721) again became secretary of state. But he was no longer the acknowledged leader of the whigs. The superior talent of Walpole, his financial abilities, and his influence in the house of commons, caused a change in the relative position of the two ministers, and converted those who had been so long friends and colleagues, and who were also connected by ties of marriage (for Townshend had married Walpole's sister), into rivals and enemies. An open and unseemly quarrel broke out between them. They seized each other by the collar, and then laid their hands upon their swords. The interposition of friends prevented a duel; and Townshend, resigning the contest, retired to Raynham, to cultivate his paternal acres. Walpole, on being asked the cause of his difference with his brother-in-law, replied, "As long as the firm was Townshend and Walpole, all did very well; but when it became Walpole and Townshend, things went wrong, and a separation ensued." Townshend introduced the turnip into Norfolk from Germany, and thus effected a most beneficial revolution in agriculture. He steadily refused to reappear in public life, and died at a good old age, in June, 1738, leaving behind him a high reputation for integrity and steady consistency in sound and constitutional principles of government.

TOWNSHEND, The Right Hon. CHARLES, English orator and statesman, was second son of the third viscount Townshend, and grandson of the foregoing. He was born in 1725, and entered the house of commons in 1747, as a supporter of the Pelham (whig) administration. His first great speech was against the marriage bill in 1753, which gained him a great reputation for eloquence. Upon the dissolution of the whig government, the earl of Bute gained him by the offer of the post of secretary at war. On Bute's resignation in 1763, he was appointed first lord of trade and the plantations. By this time, the versatility of his political career had obtained him the appellation of "the Weathercock." In the Chatham ministry of 1766, he accepted the post of chancellor of the exchequer, and leader of the house of commons. When lord Chatham, in a distempered state of mind, abdicated the post of first minister, Townshend broke loose from all restraint, and manifested the greatest vanity, ambition, and arrogance. George Grenville, smarting under the defeat of his favorite scheme of taxing America, on one occasion, in the middle of his harangue, turned to the ministers: "You are cowards," he said; "you are afraid of the Americans; you dare not tax America." Townshend's fiery temper was kindled, and he exclaimed: "Dare not tax America! I dare tax America." Grenville retorted: "I wish to God I could see it!" and Townshend replied: "I will, I will." He was not allowed to forget his pledge; and finding the notion of an American revenue agreeable to the court, and not unpalatable to the house of commons, he proposed and carried those measures that led to the separation of the

American colonies. Townshend's wife was created a peeress, and he was about to be intrusted with the formation of a ministry, when he was carried away by a putrid fever (Sept. 1767) in this 42d year. The difference between his contemporary reputation and his fame is very striking. He was ranked as an orator with Pitt. He was far more popular than the great commoner with the house of commons; yet his name will not go down to posterity, save in the annals of his time. Burke called him "the delight and ornament of the house of commons." Macaulay speaks of him as "the most brilliant and versatile of mankind," who had "belonged to every party, and cared for none." Earl Russell describes him as a man utterly without principle, whose brilliant talents only made more prominent his want of truth, honor, and consistency." He married Caroline, daughter and heiress of John, second duke of Argyll and Greenwich, and widow of the earl of Dalkeith, and had the discrimination to select Adam Smith as the tutor and traveling-companion of his step-son, the youthful duke of Buccleuch.

TOWNSHIP, in English law, means a division of a parish in which there is a separate constable, and for which there may be separate overseers of the poor.

TOWSON, JOHN THOMAS, b. in England, 1804; son of a watch maker who intended him for that business. He studied science, and was the first to call the attention of photographers to the fact that chemical and luminous foci are of different length. He was also the first to take a photograph on glass and to use the reflecting camera. He afterward made tables to facilitate great circle sailing and invented composite and windward great circle sailing. He afterward invented tables for the reduction of ex-meridian altitudes. In 1863 he wrote for the board of trade a book on the deviation of the compass.

TOWSON, NATHAN, 1784-1854; b. Md.; capt. in the U. S. army in the beginning of the war of 1812. With the co-operation of the naval forces he captured the British brig *Caledonia*, at fort Erie; he was engaged at Queenstown, fort George, and Stony Creek; wounded in a skirmish on the outworks of fort George, N. C. He participated in the capture of fort Erie under Scott, was prominent in the battle of Chippewa, and remained at the front to the end of the hard fought battle of Niagara. He rose by brevet through successive grades to be maj.gen. for services in the Mexican war.

TOXICODENDRON. See **SUMACH**, *ante*.

TOXICOLOGY is the term commonly employed in medical jurisprudence to designate the science of poisons. It embraces the physical and chemical history of all known poisonous substances, the methods of testing for them, their action on the living body, the *post-mortem* results which they occasion, and (according to some writers) the medical treatment that should be adopted. The word has a somewhat far-fetched origin. The Greek word *toxicon* signifies "anything relating to *toxon*, a bow;" hence, with the word *pharmakon*, a drug, it was used to designate "poison for smearing arrows," and finally, *poison* generally. See **POISONS**.

TOXODONTIA, an order of extinct mammals from the tertiary deposits of South America, the true position of which is still doubtful, as their fossils indicate affinities to the *ungulates*, the *edentates*, and the *rodents*. Skull massive, the molars and premolars are convex outward and concave inward, with flat grinding surfaces, having the peculiarity of being rootless and growing from persistent pulps. The canines in the lower jaw are small. Dental formula: $i \frac{2-2}{3-3}; c \frac{0-0}{1-1}; pm \frac{4-4}{3-3}; m \frac{3-3}{3-3} = 38$. The femur has no third trochanter. The only known genera are *toxodon* and *nesodon*.

TOYS. The making of toys forms a very important industrial occupation. Large numbers are made in London, Birmingham, and other places in Great Britain; but by far the largest number are made in Germany and Switzerland. Nürnberg is especially important in this respect, a large portion of the inhabitants of that town being engaged in the manufacture and trade in toys. The value of the toys imported annually into Britain is about £140,000.

TRACERY, the beautiful forms in stone with which the arches of Gothic windows are filled or traced for the support of the glass. These forms vary with every variety of Gothic architecture. Gothic windows were at first narrow, and were covered with a simple arch. Then two windows were grouped together, and an arch thrown over both. The space thus inclosed became part of the window, and was at first pierced with a circle, quatrefoil, or other opening. When three or more windows were grouped under one arch, the *shield* or space in the arch became larger, and was pierced with apertures of various forms. In the early pointed styles, these were usually circles filled with cinquefoils, trefoils, etc. During the decorated period the tracery became more varied in form, being composed of squares, triangles, and other forms, filled with foils, and having the appearance of being packed together. This kind of tracery is called "geometric." The windows of the transition from decorated to perpendicular had tracery of a more flowing character, while that of the perpendicular period (q.v.) became almost entirely composed of vertical lines. The flamboyant (q.v.) or contemporary style in France had tracery of a very different description—being as free and graceful as the other was straight and stiff.

Panels are often filled with tracery, the exteriors of the perpendicular period being covered with such. The woodwork of all periods is filled with ornamental tracery.

TRACHEA. THE, is sufficiently described in the article **RESPIRATION**. We have here only to notice those affections of this tube which require surgical or medical aid.

Foreign bodies occasionally pass through the larynx into the trachea. In cases of this kind, the patient who has had some foreign substance in his mouth which is supposed to have been swallowed, is seized with a convulsive cough, threatening suffocation, but subsiding after a time. The symptoms that then ensue vary with the weight and figure of the substance, and according as it is fixed or movable. A large and very irregular body may be impacted in the trachea, and may thus more less obstruct the respiration on both sides of the chest; and this obstruction will probably soon be increased by the inflammatory products that are excited. A small heavy body will usually pass through the trachea into one of the bronchi (usually the right), or into one of its branches, obstructing respiration to a less extent.

"If the foreign body be allowed to remain, the progress of the symptoms presents much variety in different cases. Death may occur from spasm of the glottis, or, the foreign body being propelled upward into the rima, death may take place by its mechanically preventing the passage of air, or rupture of one of the cerebral blood-vessels may be produced during one of the fits of coughing. At a later period the lungs may become congested and emphysematous, or bronchitis, pneumonia, or pleurisy may supervene."—Gray's article on "Injuries of the Neck," in Holmes's *System of Surgery*, vol. ii. p. 306. Although inversion of the body, together with succussion and lateral movement of the larynx, has in some few cases been successful, it is now deemed advisable by the highest authorities to precede the attempt at removal by making an artificial opening into the windpipe. A free aperture is thus secured for respiration, spasm of the glottis is prevented, and the foreign body is commonly expelled through the artificial opening, or falls through the glottis into the mouth.

Rupture of the Trachea from external injury occasionally happens, and generally proves fatal in consequence of the rapid and extensive emphysema which usually ensues. It is too rare an accident to require a more special notice.

Wounds of the Trachea are sufficiently described in the article **THROAT**. With the exception of croup (q.v.), there is no special disease of the trachea; and indeed in croup the trachea is seldom exclusively affected. Hence the term *tracheitis*, used by some nosologists as synonymous with croup, is hardly warrantable. Similarly, in more advanced life, the trachea is doubtless often the seat of inflammation, but never the special and exclusive seat, and both the symptoms and treatment merge into those of bronchitis or laryngitis.

TRACHEOTOMY AND LARYNGOTOMY. The air-passages may be opened in three different situations—namely, through the crico-thyroid membrane (see **LARYNX**), when the operation is termed laryngotomy; through the cricoid cartilage and the upper rings of the trachea, the operation being known as laryngo-tracheotomy; and through the trachea, below the isthmus of the thyroid gland, constituting tracheotomy proper. Laryngotomy and tracheotomy are more commonly performed than laryngo-tracheotomy, to which no further allusion is required. Laryngotomy is more quickly and easily performed, especially in adult males, and is less dangerous; tracheotomy is a more difficult, tedious, and dangerous operation, but in some cases (as, for example, where there is any necessity for introducing the forceps) must be selected. It is unnecessary to enter into details regarding the modes of performing these operations. When the operation is completed, a large curved tube to breathe through is inserted in the aperture, and secured round the neck with a tape.

A double tube or canula possesses many advantages, as, by withdrawing the inner one, which should slightly project at its lower extremity, it may be cleared of any mucus or blood that may have accumulated in it, without disturbing the wound. The caliber of the inner tube should always be sufficiently large to admit as much air as usually passes through the chink of the healthy glottis. The after-treatment is much the same as that required for wounds in the throat (q.v.). "Opening of the air-passages may be required," says Mr. Gray, "in any case of disease or injury which produces mechanical impediment to the passage of air from the mouth into the trachea; in cases of foreign substances in the air-passages; and in some cases of suspended animation where artificial inflation of the lungs cannot be performed by the ordinary means."—Holmes's *System of Surgery*, vol. ii. p. 317. In the case of a foreign body, its situation will determine the seat of the incision. Among the cases in which tracheotomy is, or may be, required, are cut throat, acute laryngitis, croup, diphtheria, chronic inflammation, and ulceration of the larynx, necrosis of the laryngeal cartilages; tumors, excrescences, or epithelial growth within the larynx; tumors (bronchocele, abscesses, etc.) external to the larynx or upper part of the trachea, and impeding respiration by pressure, etc. It has also been recommended, but with little advantage, in hydrophobia, tetanus, and severe forms of epilepsy, with the view of relieving the suffocating spasms that occur in these diseases. Laryngotomy may advantageously be resorted to in cases of spasm of the glottis, in inflammation with œdema of the cellular tissue of the larynx, in inflamma-

tion of the tongue, in tonsillitis and pharyngitis, if the swelling is so great as to produce symptoms of suffocation, etc.

TRACHOMA (derived from the Greek *trachus*, rough) is the term employed in ophthalmic surgery to designate a granular condition of the mucus covering of the eyelids, often accompanied with haziness and vascularity of the cornea. It is one of the most serious *sequelæ* of purulent ophthalmia (q.v.).

TRACHYTE, a volcanic rock, principally composed of felspar (q.v.), confusedly agglomerated in crystals, which are usually very small. Crystals of mica and hornblende are often also present, and more rarely crystals of augite, all imbedded in a felspathic paste. The name is from the Greek *trachus*, rough; the rock being rough to the touch. *Trachytic porphyry* is a porphyry essentially composed of trachyte. By some geologists, trachyte has been made the name of a class of volcanic rocks, in which clinkstone, obsidian, and pumice are included.

TRACING-PAPER. See PAPER.

TRACTARIANISM, a remarkable and important movement in the English church during the second quarter of the present century, which consisted in an endeavor to revive and bring into prominence the principles of antiquity, catholicity, and authority recognized in some portions of the Anglican formularies, in contrast to the Protestant sentiments long and widely prevailing. The name is derived from a series of papers entitled *Tracts for the Times*, published at Oxford during the years 1833-41, hence called the "Oxford Tracts." The causes of this remarkable reaction it would be difficult to ascertain. The agitation of the question of Roman Catholic emancipation led, in some cases, to the study of Catholic theology, with a view to determine the real grounds of difference between the Roman and Anglican churches; and the religious and æsthetic tone of Wordsworth's poetry, still more developed in Keble's *Christian Year* (published in 1838), may have disposed some minds to sentiments to which it was akin. The lectures of bishop Lloyd, when regius professor of divinity at Oxford about 1823, on the prayer-book and the council of Trent, are considered to have led the way to the teaching of the *Tracts*. But the immediate origin of the movement appears to have been the alarm aroused for the interests of the English church on the occasion of the suppression by the reform government of some of the Irish sees, and threatened alienation of Irish church property. It is said that about that time a meeting of clergymen took place at Hadley, in Suffolk, at which measures were concerted for opposing the alleged latitudinarian tendencies of the day, and restoring the high-church theology of the Anglican divines of the 17th century. The chief promoters of the movement were the rev. John Keble (q.v.), author of the *Christian Year*, and formerly professor of poetry at Oxford; rev. J. H. Newman (q.v.) and R. H. Froude, fellows of Oriel; the rev. E. B. Pusey (q.v.), regius professor of Hebrew, and canon of Christ church; rev. Isaac Williams, fellow of Trinity, author of the *Cathedral and other Poems*; rev. Hugh Rose of Cambridge; and others. The *Tracts* were issued anonymously, and, together with articles in the *British Critic* by the same writers, produced a great effect, especially among the clergy. Protestant principles were openly discountenanced, and tenets closely resembling those of the church of Rome were boldly put forward. The doctrines of apostolical succession, priestly absolution, baptismal regeneration, the real presence, the authority of the church, and the value of tradition, which had long lain hid in the language of the prayer-book, were widely revived and taught, and caused much alarm in some quarters; though it must be admitted that those principles had always been held by a portion of the English clergy, and claimed to be only a fair exponent of the teaching of the church. The study of the Fathers and old divines, of church history and ancient liturgies, was greatly revived in the universities and among the clergy, and a host of publications inculcating with more or less extravagance the same views issued from the press. The movement proceeded, notwithstanding the general opposition of the authorities, till it culminated in the publication, by the rev. J. H. Newman, of the Tract No. 90, which was designed to show that much Roman doctrine might be held consistently with subscription to the thirty-nine articles. This being held to favor a "non-natural" interpretation, was received with general condemnation, and led to the termination of the series, to the resignation by Mr. Newman of the vicarage of St. Mary's, Oxford, and subsequently to his secession, in 1845, to the church of Rome. In this step he was followed by many of his friends and associates, though the other leaders of the movement have continued in the English church. With Mr. Newman's secession the Tractarian movement terminated; but its effect remains in several visible results: 1. The first of these may be said to be the revival and strengthening of the high-church party, which still maintains to a great extent the principles advocated in the *Tracts*; and though checked by some judicial decisions, such as the Gorham (q.v.) judgment, in the endeavor to acquire exclusive power, has gained great and perhaps increasing influence in the church. 2. Side by side with the revival of Catholic doctrines there has been a great development of ritual. The tractarian movement was early marked by the introduction of various alterations in the mode of performing divine service, such as the use of the surplice instead of the gown, intoning the prayers and singing the responses, the elevation of the communion table into an altar, the substitution of low open benches for high pews—all of which, though claim-

ing to be a restoration of ancient usage, having the authority of the law, were regarded with alarm as approximating to the church of Rome (see RITUALISM). 3. Another effect of the tractarian movement was the remarkable impulse given to the building and restoration of churches, and the revival of Gothic architecture, which has been manifested in all parts of England, and given a character to the ecclesiastical buildings of the present century which will mark them for ages to come. 4. The tractarian movement has undoubtedly been the cause of the secession of many English clergy and laity, some of them men of considerable ability and distinction, to the church of Rome, which has greatly increased the strength and influence of that communion in the country, and caused great scandal to Protestants. Lastly, the movement may, however, be admitted to have produced a great increase of learning, piety, and devotedness among the clergy, and the establishment of colleges, sisterhoods, and other religious and charitable institutions.

TRACTION ENGINES. See STEAM-CARRIAGE.

TRACTORS, METALLIC. See PERKINS, ELISHA.

TRACT SOCIETIES, organizations formed to increase the circulation chiefly of religious truth. Before the invention of printing great exertions were often made to multiply copies of religious writings. Wycliffe wrote more than 100 tracts which his disciples copied and circulated; some of them were sent as far as Bohemia, and brought John Huss to a knowledge of the truth. The invention of printing was exactly in time for the reformation. Luther employed the press with great energy, and his numerous tracts were powerful instruments in spreading the truth. In the 18th c. many associations were formed to advance the work, several of them by members of the church of England; in 1742 John Wesley sent forth many tracts and books; in 1750 different denominations united in forming a tract society; in 1790 the "cheap repository tracts" were issued in great numbers to counteract the diffusion of French infidelity; in 1799 the religious tract society was organized in London, since grown to be the largest in the world. Of its publications, in more than 100 languages, 1600 million copies have been issued. Each religious denomination in England also has a society of its own; and the opponents of religion adopt the same means for spreading their views. In the United States religious tracts and volumes early appeared in considerable numbers, and societies to circulate them were formed among the Methodists in 1789, and at the beginning of this century in Boston, New Haven, New York, Philadelphia, and Baltimore. The New York tract society, formed in 1812, became the American tract society, 1825. The New England society, formed 1814, changed its name to the American tract society, 1823, and in 1825, continuing the name, became a branch of the national society having the same name, at New York. This last, now known as the American tract society, is a union organization in which many different denominations join. For the first two years of the national society's work, only tracts were published; in the third year the first volumes appeared; in the fourth the monthly distribution was started; in the eighth the attempt began to send volumes into every family; in 1841 colportage was commenced; the next stage of progress was the establishment of periodicals; first the *American Messenger*; the *German Messenger*, 1847; the *Child's Paper*, 1852; the *Illustrated Christian Weekly*, 1871. During the rebellion 172 new publications for soldiers were issued. From the organization of the society large grants of money have been annually made to aid in the distribution of books among foreign nations—amounting in 50 years to \$615,000. The society has provided more than 5,000 publications, of which 1100 are volumes. Of the home publications 1500 are in 11 foreign languages for immigrants, supplying them with almost their only Christian literature. Of the periodicals, 164 million copies have been sent forth; of the other home publications, 27 million vols. have been printed, and 2,000,000,000 pages of tracts. Of these, annual grants to the destitute are made to the amount of \$50,000. The work of colportage in 35 years circulated about 14 million vols. and made nearly 12 million family visits, chiefly in portions of the country where for the time book-stores, schools, and churches did not exist. The total amount of donations and legacies received and expended during 50 years was \$4,300,000, and the sales were nearly \$9,000,000. Besides this undenominational work, the leading denominations have their own publication boards which are large and efficient agencies.

TRACY, JOSEPH, D.D., 1794-1864; b. Vt.; graduated, Dartmouth, 1814; pastor of churches of Thetford and West Fairlee, Vt., 1821-29; edited *Vermont Chronicle* 1829-34; *Boston Recorder* one year; New England secretary of American colonization society, 40 years. His publications are *The Three Last Things*; *The Great Awakening*; *History of the American Board*; *Refutation of Charges against the Sandwich Island Missionaries*; was associate editor with Dr. Henry B. Smith of *American Quarterly Review*; contributed to semi-centennial memorial volume of the American board.

TRADE, BOARD OF, a department of government more correctly designated "the lords of the committee of her majesty's privy council appointed for the consideration of all matters relating to trade and foreign plantations." In 1660, Charles II. created two separate councils for trade and for foreign plantations, which, in 1672, were consolidated into one. The board of trade and plantations, after being abolished in 1675, reappointed in 1695, and passing through various modifications, was again abolished in 1782, when

its duties were transferred to the secretary of state in so far as regarded the management of the colonies, and to a committee of privy-council as regarded the other business. In 1786 the presently existing department was established by order in council, being a permanent committee of privy-council for the consideration of all matters relating to trade and the colonies. The board consists of a president and vice-president, together with the lord chancellor, the archbishop of Canterbury, the first lord of the treasury, the principal secretaries of state, the chancellor of the exchequer, the speaker of the house of commons, the chancellor of the duchy of Lancaster, the paymaster of the forces, the treasurer of the navy, the master of the mint, and such officers of state in Ireland as are privy-councillors in England. Practically, none of the members of the board take part in its deliberations except the president and vice-president. The clerks of the council are *ex officio* secretaries of the board, but their duties as such are performed by two assistant secretaries.

The functions of the board of trade are partly of a ministerial, partly of a judicial kind, and have of late years been greatly enlarged by a variety of statutes. The board is charged with the general superintendence of all matters relating to the mercantile marine. It requires and considers reports made to its inspectors and other officers, and orders returns of various kinds regarding trade and navigation. In the exercise of a certain amount of control over marine boards, it is empowered to make regulations regarding the examination and qualifications of applicants for the position of master or mate of passenger-ships. Under 17 and 18 Vict. c. 104, it grants licenses to persons to engage or supply seamen or apprentices for merchant-ships, decides on claims for wages, and investigates charges of misconduct and incompetency. In virtue of 14 and 15 Vict. c. 79, it appoints officers to inquire into and report on the condition of steam-vessels.

The supervision of railways and railway companies, both as to their original formation and their working, constitutes an important part of the duties of the board of trade. Railways were first subjected to government control by 3 and 4 Vict. c. 97, which conferred power on the board of trade to appoint inspectors of railways, to approve or disallow by-laws, to require returns of traffic, and to decide disputes between connecting lines. Further powers were added by 5 and 6 Vict. c. 55. In 1846 the increase of these duties, arising from the rapid extension of railways, led to the transfer of this department of the board of trade to a separate board, created exclusively for the management of railway business; but in 1851, this latter board was abolished, and its powers again transferred, by 14 and 15 Vict. c. 64, to the board of trade. Notices of applications for railway acts, with plans, are required to be deposited with the board before any bill can be introduced into parliament; and before any railway can be opened for traffic the permission of the board must be obtained, on the report of an inspector. On the occurrence of an accident, notice must be given to the board, which sends an inspector to inquire into the circumstances, and, on his report, the board is empowered to take what steps are judged necessary for the security of the public.

Many matters relating to the interests of trade, which come before other departments, are referred to the board of trade for information or advice. Thus there are frequent communications with the foreign office regarding the negotiation and working of commercial treaties, and with the treasury regarding alterations in the customs.

A statistical department of the board was established in 1832, whose province is to collect and publish tables containing classified information regarding the revenues, population, commerce, wealth, and moral and economical condition of the United Kingdom and its dependencies, to prepare a selection from the statistics of foreign countries, and a monthly account of trade and navigation. All applications made to the queen in council by companies or private persons for charters of incorporation are referred to the board of trade; and among the functions committed to it by statute are the registration of joint-stock companies, and of copyright in designs. The board is empowered by several local and personal acts to control the proceedings of the commissioners for regulating the employment of coal-whippers, and the discharge of coal-laden vessels in the port of London. In 1853 the department of science and art, which owed its origin to suggestions made in the second report of the commissioners for the exhibition of 1851, and was at first a department of the committee of the privy-council on education, was placed under the control of the board of trade; but in Feb., 1856, it was re-transferred, by an order in council, to the committee of the privy-council on education.

TRADE CORPORATIONS. See CORPORATION, and JOINT-STOCK COMPANY.

TRADE, LIBERTY TO, is one of the rights incident to all persons by the law of England. So absolute is this right that it is considered by courts of law to be an illegal and void covenant when a person, however deliberately, engages never to trade, for it is against public policy to support it. In the sale of the good-will of a business, such covenants are sometimes resorted to, in order to prevent the party selling a business from setting up immediately afterward the same business, and so defeating the object of the transaction. Accordingly, in all such cases, the courts have arrived at the following result: If a person engage absolutely not to carry on a particular business anywhere, his engagement is void, and not binding; but it is competent for him to engage not to carry on a particular trade within a certain specified reasonable distance—as 20 or 30 m.—from a certain point, the reasonableness being estimated according to the nature of the trade

and locality. If this engagement were not legal it would be impossible to negotiate the sale of the good-will of a business. Subject to the above restriction, any person may carry on trade in any locality he pleases. But in the case of an alien enemy, a license of the crown is necessary to enable a subject to carry on trade with him. It was also anciently a maxim, now obsolete, that none of the king's subjects could lawfully trade with a nation of infidels without the king's leave, because of the danger of relinquishing Christianity. Though, at common law, every man is free to carry on what trade he pleases, still there are a great variety of lawful trades which are subjected to certain restrictions, either ostensibly for purposes of revenue, or for the purpose of protecting the public from certain evils attending such trades. Thus attorneys, publicans, manufacturers of cotton, etc., chimney-sweepers, and many miscellaneous employments, are subject to various restrictions. Formerly, also, the liberty to trade was considerably impeded by the ancient corporations and guilds; and it was a practice for these guilds to impose certain conditions on all persons who sought to trade in large towns; otherwise they were excluded from certain commercial as well as political privileges. As the by-laws, which were the instruments of creating these restrictions, were often authorized by charter of the crown, or grew up by ancient use and custom, then in harmony with the spirit of the age, the courts had a difficulty in treating them as illegal. But by the municipal corporations act which passed for England in 1835 (5 and 6 Will. IV. c. 76), these restrictions were abolished. That act recited that, in divers cities, towns, and boroughs, a certain custom had prevailed, and by-laws had been made that no person, not being free of a city, town, or borough, or of certain guilds, mysteries, or trading companies, should keep any shop, or place for putting to show or sale any wares or merchandise for hire, gain, or sale; and it enacted that henceforth, notwithstanding such customs or by-laws, every person in any borough might keep any shop for the sale of all lawful wares and merchandise by wholesale or retail, and use every lawful trade, occupation, mystery, and handicraft for hire, gain, sale, or otherwise within any borough. The city of London, however, was excepted from that act, and some of these old restrictions still flourish there. The law in Scotland and Ireland was also altered at the same time. The repeal of the navigation laws (q.v.) has also removed many restrictions on those who traded with ships.

TRADE-MARKS. The attaching of peculiar marks by which manufacturers seek to distinguish their own productions from those made by other persons, is an important privilege, both as concerns the producer and the consumer; because no honest manufacturer will invent and apply a trade-mark to his wares unless he is convinced that they possess some special excellence which he wishes thus to make known; and it is desirable the public should have the benefit of such direction in the choice of their purchases as is thereby afforded. Nevertheless, until 1862, the law in Great Britain was in a very unsatisfactory state upon this subject, and the marks of celebrated manufacturers were pirated with the most reckless audacity, both by British and foreign firms, in most cases to enable them to pass off upon the public articles of very inferior character. For such infringement, the only remedy was to proceed by injunction from the court of chancery—a process which was far too troublesome and costly for the class of inventors most likely to be injured. The “merchandise marks act” of 1862 has remedied this evil, and simplified the whole matter, by making it a misdemeanor to forge or counterfeit any trade-mark, or falsely to apply any such trade-mark with intent to defraud, whether applied to a cask, bottle, stopper, vessel, case, cover, wrapper, band, reel, ticket, label, or any other thing, in or with which any commodity is sold, or intended to be sold. It is henceforth an offense to sell or expose, either for sale or for any purpose of trade or manufacture, articles with forged or false trade-marks, under a penalty of a sum equal to the value of such articles, and a sum besides not exceeding £5, or less than 10s. Every addition to, or alteration and imitation of, any trade-mark made with intent to defraud—the intent being the essence of the offense in all cases—is to be deemed a forgery, and punished as such. It is further made obligatory on every person who shall sell an article having a false trade-mark to give information as to where he procured it, on a demand for such information being made to him in writing. In 1875 an act was passed to establish a register of trade-marks, and amended in 1876, to the effect that, after July 1, 1877, no steps can be taken to prevent infringement unless the trade-mark has been entered in the register established under the superintendence of the commissioners of patents.

To mark any false indication of quantity is also punishable with penalties. A conviction under the act is not to affect the civil remedy at law, nor need any indictment specify who is intended to be defrauded by the fraudulent use of spurious marks. The punishment for the misdemeanor may, at the discretion of the court, either be by fine or by imprisonment, with, or without hard labor; and in the event of fines not being paid, the offender may be imprisoned until they are. The vender of an article with a trade-mark is to be deemed to warrant or contract with the purchaser that the mark is genuine, unless otherwise vouched for in writing. A similar obligation rests upon those who sell articles marked with specific quantities. In suits at law, or in equity against persons using forged trade-marks, the court may not only order the destruction of the articles fraudulently marked, but may by injunction prevent a repetition of the offense. The time during which proceedings may be taken is limited to three years.

TRADE MARKS (*ante*), cannot, as a rule, be a proper name; but where a proper name is taken which does not denote the origin of the goods, but is merely historical or fanciful, it may be a good trade mark. But such fanciful name must not denote or attempt to denote the character of the article on which it is claimed as a trade mark. If such name really denote the character of the article, it is a label; and if not, it is void. A signature, or the *fac-simile* of a signature, may be a trade mark; and so may a pseudonym. The validity of a trade mark is entirely independent of its novelty; and the same mark, however frequently it may have been used, may be good as applied to a different article.

TRADE PROTECTION SOCIETIES are associations composed of merchants, tradesmen, and others, which have been formed for the promotion of trade, and for protecting the individual members from losses in their business transactions with each other, and with the community at large. They began to spring up about the middle of the last century—one of the first started in this country being the "London association of guardians for the protection of trade," which was established in 1776. In 1871 the board of trade granted a license for incorporation to one under the companies acts, 1862-67. The operations of these societies used to be confined chiefly to the compilation of registers of bankruptcies, insolvencies, and private settlements with creditors. The registers were formed thus: Each member informed the secretary of his society of the name, occupation, and address of the customers who became insolvent, with the amount of dividend their estate yielded; and latterly, the circumstances connected with such insolvency, whether recklessness or extravagance on the part of the bankrupt, or innocent misfortune. These circumstances were carefully recorded, and the information thus collected having been found useful, means were taken to render the registers more complete. With this view, new sections were added to the registers, and special attention was directed to the exposure of swindlers, and persons who had been guilty of fraud or embezzlement. The information accumulated in the registers, though always accessible to such members as made inquiry at the offices of the society, was kept strictly private from all others. But the extraordinary development of commercial enterprise which took place in the early part of this century, added a new stimulus to the trade protection movement. The registers which the societies now printed and circulated among their members contained transcriptions from the following public records: viz., the records of the bankruptcy courts, registers of assignments and trust-deeds, bonds or warrants of attorney, bills of sale, judges' orders, protested bills, and decrees in absence. In addition to the diffusion of information of this description, the societies undertook to record past-due bills and accounts for their members, to investigate the circumstances connected with bankruptcies and insolvencies, collect dividends, and perform the general agency business of their members—the whole being done under the direction of a committee appointed for this purpose. Committees were also appointed to scrutinize all measures affecting trade and commerce which might be introduced into parliament, and to promote legislation favorable to the commercial interest. The sphere of action of trade protection societies thus rapidly widened, and their utility kept pace with their growth. The older societies established offices and branches throughout the country; and new societies sprang up in the large provincial cities, which in their turn opened agencies and branches in other towns and villages; and the various societies being in communication, the machinery of the whole is available for the purposes of each.

TRADES-UNIONS, in their character of benefit and sick societies, do not fall within the range of this article. We have principally to consider them as associations of workmen against employers for the purpose of gaining, either in time or money, a larger share of the profits of their trade. A brief historical sketch of the growth of the principle of combination may fitly introduce the subject.

In one form or other combination has always existed ever since the employed and employing classes became distinguishable from each other. For a long time after the conquest the inhabitants of England were of two classes, freemen and slaves. These relations not permitting work for wages, there could be then no combination in the modern sense. About the middle of the 13th c. we find that wages had begun to be paid, so that for 600 years there have been laborers receiving a money price for their services, competing for employment, and arranging terms with employers. The power of legislation was, however, with men who believed their interests antagonistic to those of the workmen, and its complexion was always favorable to masters. When, after the great pestilence of 1349, the reduced number of laborers demanded better pay, it was enacted that carters, plowmen, and agricultural servants generally should be content with their previous rate of livery and wages; they were to continue to be paid in kind where payment in kind had been customary; they were forbidden to hire themselves for the day, but must take service for a year or other fixed period; a rate of wages was fixed for weeders, haymakers, mowers, and reapers; and their hiring for the future was to be in public. A little later, in 1363, the diet and clothing of artificers and servants were fixed by act of parliament, and clothiers were required to make, and tradesmen to sell, cloth of a regulated quality at a regulated price. The rate at which labor should be purchased was fixed after this fashion for almost two centuries, and the practice declined solely because of the impossibility of preserving it. But even within the last 150 years a relief

of the old superstition revived, so characteristic as to be worth notice. A tariff of wages, drawn up in 1725 by the Manchester justices, declares that any workman conspiring to obtain more than the rate thereby fixed, should for the third offense stand in the pillory and lose an ear. Economical error, it will be seen, is by no means the monopoly of the poor.

One of the earliest forms assumed by combination is shown by the statutes, passed about 1400 A.D., which excluded from city labor all who had been trained to the plow up to the age of 12 years. The evasion of these acts was the subject of bitter complaints from the city inhabitants, whose practical union against agriculturists was defeated by the sending of country children into towns as apprentices before they reached that age. For generations this jealousy of corporation against corporation continued with more or less intensity.

In the more ancient forms of associated labor, such as guilds and chartered companies, combinations such as those which now prevail could not exist. There were no masters and workmen as separate and opposed classes. Producers were united as against the community, and they had no reason, so long as the guild was prosperous, for internal dissension. When, by the abuse of their power in prosperity, they incurred hostile legislation, they became disintegrated; workmen were employed who had never been apprentices; and ultimately the owners of capital and the owners of labor became distinct and often opposing camps. Instead of a guild or trade being any longer a compact monopolist body, acting for itself against the community, the tendency was thenceforward for combination of one section against the other.

Trades-unions, organized for purposes such as those which contemporary unions contend for, have existed for more than three centuries. So early as 1548 a statute of Edward VI. is directed, among other culprits, against certain "artificers, handicraftsmen, and laborers," who had "sworn mutual oaths" to do only certain kinds of work, to regulate how much work should be done in a day, and what hours and times they should work. The usual penalties of fines, pillory, and loss of ears were to follow a breach of its enactments. Add the regulation of wages to the objects enumerated in this statute, and we have in effect the trades-unions of the present day. Many fruitless acts were afterward passed to prevent combinations for raising wages. So long as a tacit bond existed, and unquestionably one did and does exist, among employers, reprisals on the part of workmen were certain, and the only question was, whether the right of combination should be recognized by the law, or whether the parties who had recourse to it should be driven into secrecy and illegality. But it was not till 1824 that the legislature had sufficient wisdom to repeal the numerous and vexatious acts of parliament by which it had been sought to prevent the union either of masters or workmen. By the celebrated act of that year the combination of either workmen or capitalists was legalized, so long as the unions refrained from violent interference with persons who might refuse to join them. This act was supplemented by another, passed in 1825, which in effect declared legal all combinations to settle rates of wages or hours of work, and illegal all such as aimed at other methods of controlling employers in the use of capital, or in processes of manufacture. The latest legislation (see COMBINATIONS) goes further still, declaring combinations legal even when acting (peaceably) in restraint of trade.

A modern trades-union is a rather complex organization. Perhaps the best definition of them is the one given by the social science "committee on trade societies," appointed at Bradford in 1859, and which published its report in 1860. The committee included Dr. Farr, prof. Fawcett, Mr. W. E. Foster, and many other well-known names, and its investigations were very searching and valuable. Indeed, its report is even yet by far the best repository of facts on the subject. A trade society is therein defined as "a combination of workmen to enable each to secure the conditions most favorable for labor." The capitalist's accumulations afford him an advantage which the laborer, without association, does not possess. The funds of the union are intended to supply this deficiency. As accessories, the unions collect funds for other purposes, such as benefit societies, insurance of tools, libraries, and reading-rooms; but their trade objects are those with which we are especially concerned. The following means of assisting and defending the trades associated are enumerated by the committee as now in general use—1. Publishing periodically the state of the trade in different parts of the country; 2. Keeping registers of men unemployed and of masters wanting men; 3. Assisting men from town to town in search of employment, and occasionally to emigrate; 4. Regulating the number of apprentices in the trade; 5. Maintaining men in resistance to employers; 6. Regulating number of working hours, and preparing trade rules; 7. Organizing strikes.

The advocates of the unions insist that they are the only means by which workmen can defend themselves against the aggression of employers. It is argued that the individual laborer has no chance of resisting the capitalist on equal terms; that starvation treads too closely on his heels to permit his successfully opposing a reduction of his wages, however arbitrary or unjust. It is urged that associations of employers are practically universal, and that their object is mainly to secure for themselves the largest possible share of the profits which are the product of capital and labor united. It is further said that in the event of any depression of trade, the masters invariably attempt to reduce wages; and that when trade improves, they defer as long as possible the restoration of the former rate. Thus, workmen are the first to feel commercial disaster and the last to

benefit by better times. Any attempt to remedy this state of things by individual action would, it is conceived, be abortive. The capitalist might easily do without the services of any single laborer, while to the latter the loss of employment might be ruin. Association on the part of the employed class becomes, therefore, a necessity, and their organization puts them at once much more nearly on an equality with employers when negotiating either as to rates of wages or terms of labor. That in both these matters there is a constant gravitation against the workman seems to be admitted by most who have considered the subject, and there is difficulty in suggesting any effective resistance to the downward tendency, except that of combination. Unionists point to many regulations in the interests of workmen which combination has enabled them to introduce, and while they freely admit that in numerous instances the contest between labor and capital has resulted in the apparent defeat of the former, yet they assert that, in the long run, most of the points contended for have been gained. They maintain that in very many trades, they have succeeded in preventing abuses, and that the unions have contributed, more than any other agency, to make "the workman's life regular, even, and safe." Further, it is contended that the necessity for strikes will become continually less as organization becomes more perfect and uniform; the just limits of their action will be more fully comprehended; the sufferings and losses of past strikes will act as a warning against too precipitate action in the future, either on the part of masters or men; and that, in the end, the main results of combination will be secured, without the necessity of having recourse to the arbitrament of force, either in the shape of strikes or lock-outs—the latter of which, indeed, is only a strike of the employers against the employed.

Yet it cannot be concealed that against this catalogue of uses may be set many and serious evils. Some unions dislike the exertion of special or superior ability by any of their members, deeming it an injustice to the rest that one should gain higher pay or win a loftier position. In many cases, as a matter of deliberate policy they set themselves against and discountenance any elevation of the standard of labor, and so act as an effectual bar to the industrial progress of their class. In other instances, strikes are determined upon by unions at times when the position of the market renders success impossible, resulting in severe and prolonged suffering; while in some "highly skilled and limited trades," a far higher rate of wages has been enforced for a time than the value of the labor performed would justify, in the end materially checking production, or transferring the industry itself to other countries. The same effect has been produced by the arbitrary enforcement, in some branches of manufacture, of obnoxious restrictions upon the hours and mode of working. Thus, Birmingham lost much of that portion of its hardware manufacture which is now carried on by machinery, in consequence of the resistance offered by the Birmingham artisans to the introduction of machine-labor; and the steel manufacture threatened at one time to migrate from Sheffield, on account of trades-union dictation. There is, moreover, another and serious class of objections. There can be no doubt that unions foster an unfortunate spirit of antagonism. Being constantly and consciously on the defensive, they come at last to suspect evil in every movement, and to put a sinister interpretation on every action of employers. The special interests of the trade affected are too often the only objects cared for; and narrow, selfish, and unjust regulations are enacted for its supposed benefit. One trade is isolated from another; one class of laborers fences itself off against incursions upon its peculiar territory and tries, by the limitation of the number of apprentices, the enforcement of objectionable terms of service, and other coercive methods, to remain a close monopolist corporation. It is needless to point out how injuriously such a policy affects the working-classes generally, and what a complete subordination it implies of the general well-being to the desired prosperity of a small and selfish number. In some trades, the practice of coercion has grown into systematic terrorism and crime. The Sheffield grinders and the Lancashire brickmakers began with merely refusing to work with non-unionists; but their methods of procedure have ended in frequent brutal and murderous outrage. The revelations of the special commissions of 1867 are among the saddest contributions to English history.

One of these special commissions—that of Mr. Overend and his colleagues at Sheffield—is of sufficient importance and interest to warrant rather special reference. Out of about sixty trades-unions in that town, thirteen are proved to have promoted or encouraged outrages of various degrees of criminality, from theft and intimidation up to personal violence and murder. The most ordinary method of coercion in use bears the name of "rattening," and is employed to enforce payment of contributions to the unions, and to compel obedience to their rules. If any workman fall into arrear with his payments, or infringe the rules of the trade to which he belongs, his wheel-bands, tools, or other materials of work are secretly removed, and held in pledge, until he submits to the requirements of the union. This is done most frequently under the direct orders of the union officers; but sometimes a private member "rattens" another, who is known to be in some way at issue with his society, and takes the risk of his action being adopted by the remainder. In the majority of cases, on due submission and a moderate payment, the property rattened is restored to its owner. The practice is defended on the ground that it is the readiest and most effectual means of compelling the regular payment of contributions to the union funds and of enforcing obedience to union orders.

So thoroughly is it understood that rattening is the work of a trade society, that a man whose tools are taken never thinks of applying to the police for restitution; he communicates with the secretary of the union which governs his trade. In cases of contumacy on the part of a member, it is sometimes attempted to saddle his employer with the cost of the rattening, even when he is no party to the dispute, on the ground, that he ought to compel his workmen to comply with the rules of the union. Rattening is generally successful in securing its ends; but if it fail, an anonymous letter is sent to the refractory person, threatening vengeance in the event of further resistance; and in only too many instances, the threats have been carried out to the last extremity. Thus, in 1854, a man named Elisha Parker had his house blown up by gunpowder, his horse was hamstrung, and he himself disabled by a pistol-shot, because he worked with non-union men, after being warned to leave his employment. In 1857, James Linley was shot at and wounded for changing his business of grinding scissiors for that of grinding saws, and keeping a greater number of apprentices than the rules of the trade prescribed. As he still persisted, he was shot to death with an air-gun in 1859. At other times, powder has been mixed with filings or other materials near the working apparatus of obnoxious persons, who have often suffered serious injuries from its explosion. The list of outrages, fatal and other, might be largely extended; but those we have given are not unfair representatives of the whole. It is only fair to add that of late years the evil pre-eminence of Sheffield has not been so obvious, but the old spirit occasionally asserts itself still, though happily in some what milder forms.

The bellows-cutting by the chain-makers of the midland districts, during their strike of 1859, is somewhat analogous to the rattening at Sheffield; and disclosures of similar practices were made at the inquiry before Mr. Pickering and others in Manchester, also in 1857. We have not space to go into detail; but the examples of Sheffield, Dudley, and Wolverhampton were faithfully repeated. Powder explosions, personal injuries, the wholesale destruction of bricks by trampling upon them while soft, a shed destroyed by naphtha, the insertion of needles into the clay, so as to disable the workmen; such were among the characteristic confessions made by the witnesses. Among other reasons given for a strike was one that an employer had himself "set a brick," a task expressly reserved for brick-setters; and among the restrictions on trade was one forbidding the use in Manchester of bricks not made within the Manchester district, a circle about eight miles across.

Although in very many instances strikes have been begun and concluded without the intervention of trades-unions, yet, as a matter of fact, all the more notable strikes have either been organized by them, or had their direct support; and of late, the tendency has been to associate the unions of different trades into one body, so far as this particular policy is concerned. This article would therefore be incomplete without a brief reference to some of the more remarkable contests between masters and workmen.

Among the leading strikes, few, if any, have occupied the attention of the public more than the struggle between the amalgamated society of engineers and their employers, which took place in 1851-52. It originated in the determination of the workmen to abolish piecework and over-time. The dispute was further complicated through a demand made by the mechanics at Messrs. Hibbert & Platt's works, in Oldham, insisting that certain self-acting machines in use there should be attended to by skilled laborers only. Thirty-four Lancashire firms entered into a written agreement to meet any action on the part of the men by the immediate closing of their establishments, which furnished employment to 10,000 people. A similar resolution was adopted by the master engineers of the London district. The men left work on the 1st of January, 1852, and the works were formally closed on the 10th. The strike virtually ended on the 30th March, when the men conceded the points in dispute, with the exception of an obnoxious declaration insisted upon by the masters, that none of the men employed should, for the future, either directly or indirectly support trades-unions. The cost of the strike is understood, besides the enormous loss of wages, to have exceeded £40,000, including moneys contributed to non-society men. Great numbers of the men emigrated, and fearful suffering was endured by thousands of families. The amalgamated society still exists, and is one of the most extensive and powerful organizations in the interest of labor in the world. In 1852, after its failure in the great struggle, it started with 7,000 members. In 1860, its members exceeded 17,000, and in 1878 they numbered 45,408. The total income of the society for 1878 was £123,881, and its accumulated funds were £251,675. It has branches in every part of the world where English engineers are employed.

The strike of 1853 in the cotton trade at Preston was also met by a lock-out. About 18,000 people were thrown out of work. The struggle lasted seven months, and during its progress public feeling was keenly roused. The 10 per cent advance in wages contended for was successfully resisted by the masters, the last chances of the work-people being destroyed by the depression of trade consequent upon the outbreak of the Russian war. The cost of the strike to the workmen and their friends, in actual money paid, was £105,000.

In 1859 there occurred a strike and lock out in the building trades of London. The object of the strike was to reduce the working day from ten to nine hours, the existing rate of wages being retained. It was met by the simultaneous closing of 225 building

establishments, at which 24,000 men were employed. The contest lasted for nearly seven months, and ended in the surrender of the men, after an enormous loss in wages and trade funds. No less than £23,000 was contributed by other trade societies, in aid of the men concerned in this dispute.

The mining trades—coal and iron—have within the last few years shown marked triumphs of labor over capital. The great Forest of Dean and South Wales strikes in the coal-trade terminated at the beginning of 1873, substantially in favor of the employed. Yet there are some later facts which tell the other way. A determined strike of the Edinburgh book printers (1872-73), for the 51 hours limit, which lasted 13 weeks, terminated in favor of the employers. Notwithstanding the absolute necessity which exists for coal in a climate and a manufacturing country like ours, and the close unions maintained by the working colliers, the coal-masters have succeeded in maintaining the upper hand, and wages are sinking back toward the old level, though now they will probably always remain at a somewhat higher point than they had reached up to 1872. The failure of the farm-laborers in 1873-74 to carry their struggle to a successful issue, even under the singularly able leadership of Mr. Joseph Arch, and notwithstanding the fact that large numbers were assisted to emigrate, so reducing the competition for employment upon which the farmers relied for victory, is another proof that triumph is not always with the men. It is only right to add that the men could scarcely be expected to succeed in their first organized attempt against a system centuries old.

Only a small proportion of existing trades-unions have registered themselves in accordance with the act 34 and 35 Vict., cap. 31; yet the report of the registrar of trades-unions showed in 1877, 278 registered trades-unions, with 260,222 members, an income of £254,565, and a fund of £374,989.

The nine-hours movement created great excitement for a time, but was practically settled in favor of the labor-classes. The first strike for it was by the Edinburgh masons in 1861. After an exhaustive struggle, the masters yielded the men's demand for a limit of 51 hours a week. Agitation was kept up by different trades in succession; and ultimately the hours of labor were generally so fixed. But in 1878 a disposition to insist on 54 hours was manifested by employers in various quarters.

The lowering of the franchise to household suffrage has lent a new significance to trades-unions. They have now become a great power in politics. There is the trades congress, which holds an annual conference in the different leading towns, and discusses questions affecting the interests of labor. They have not yet begun to publish transactions; but, no doubt, they soon will, for this congress is undoubtedly to be one of the controlling social powers of Great Britain. It appoints a committee every year, which sits in London, to look after the acts of parliament and other public movements affecting trade. Another object they contemplate is to get working-men returned as members of parliament; and this they have at last accomplished by the election to the parliament of 1874 of Mr. Alexander Macdonald for Stafford, and Mr. Thomas Burt for Morpeth.—*Mill's Political Economy; Report of the Social Science Committee on Trades' Societies*, 1860. For recent legislation on the subject of trades-unions, see the article COMBINATION.

TRADES-UNIONS (*ante*), organizations of working-men for mutual protection and assistance. They exist in Europe, in certain countries; but are most common and powerful in Great Britain and America. Their origin is properly described as "the inevitable and necessary outcome of those changes in industrial life which led to the growth of a capitalist class—men who were not craftsmen, as formerly, but manufacturers. They were fostered by the introduction of machinery, the consequent division of labor, the aggregation of large numbers of work-people in certain localities, and the inauguration of factory life." These organizations have reached great strength in England; where in 1879, four trades-unions comprised 1010 branches, 94,172 members; and had on hand funds amounting to £446,323, or \$2,250,000. These four societies were the amalgamated society of engineers; the friendly society of iron-founders; the boiler-makers and iron ship-builders; and the amalgamated carpenters and joiners. These societies disbursed in 1877, to persons out of work, £126,576; sick benefit, £50,772; superannuation, £18,810; accident benefit, £6,203; funeral benefit, £13,310. Introduced into the United States by English working-men, they have spread rapidly, until every trade has its "union." That of the railroad engineers is perhaps the most powerful and best organized. They have not succeeded in the United States as in England, in fomenting and sustaining differences between employers and employed; though they have organized important and costly strikes, and have materially deranged the system of labor by restricting the employment of apprentices in workshops, thus limiting the field for the education of the American mechanic. See COMBINATIONS; STRIKES.

TRADE-WINDS. See WINDS.

TRADITION. See RULE OF FAITH; INFALLIBILITY.

TRADUCIANISM (Lat. *traducianismus*; from *tradux*, a "vine-layer" for propagation), one of the theories adopted for the purpose of explaining the production of the soul in the procreation of the human species. The theory known as traducianism is ascribed to Tertullian as its first author; and is elaborately explained and defended by him in his

book *On the Soul*, written after he had lapsed into the Montanist heresy. In opposition to others who had held the theory of pre-existence of souls, of which pre-existing souls one is divinely infused, or, by some natural affinity, is attracted into each fœtus so soon as it has been formed by generation in the procreation of man, Tertullian taught that souls are propagated by souls as bodies by bodies, and by the same or a simultaneous process. In another place he describes this origin of soul from soul as generation, and even of a class analogous to corporeal generation; and this more gross and material exposition of the theory of traducianism is sometimes called *generationism*; which, however, is commonly looked upon as a totally distinct theory. A third hypothesis, as to the origin of the soul suggested that, in the propagation of the human species, whenever a human body is formed by generation, the soul which is to animate that body is created and by divine power infused into it. This theory is called *creationism*. The discussion of these theories in the 4th and 5th c. was much promoted by the controversies on Manichæism. See MANICHÆANS.

TRAFALGAR, CAPE, a low promontory on the s. coast of Spain, about 29 m. w.n.w. of Tarifa (q.v.), on the straits of Gibraltar. It is memorable for the great naval victory obtained off its shores by the British fleet under Nelson, over the combined fleets of France and Spain, under the French commander Villeneuve and two Spanish admirals. The British force consisted of 27 sail of the line, 4 frigates, 1 schooner, and 1 cutter; the force of the French and Spaniards united amounted to 33 sail of the line, 5 frigates, and 2 brigs. It may be remarked that the largest of the enemies' ships carried 30 guns more than the largest of the British ships. The engagement resulted in a splendid victory for the British, who captured nineteen of the enemies' ships. The victory, however, was gained at the cost of the life of the greatest of English admirals. See NELSON.

TRAGACANTH. See GUM.

TRAGEDY. See DRAMA.

TRAGOPAN, a genus of birds of the family *phasianidæ*, having the head crested, but naked on the cheeks and around the eyes; a horn-like caruncle projecting backward from behind each eye; and a loose wattle, capable of being inflated, hanging beneath the bill. The tarsi are armed with a blunt spur in the male, unarmed in the female. The species are few, and are natives of Asia. They are birds of beautiful plumage, somewhat resembling pheasants, but of more hunky form, and with rounded tails of moderate length. The first known species (*T. satyrus*) has been called the *horned pheasant*. It inhabits the higher parts of the Himalaya, Thibet, and some of the mountainous provinces of China. The tragopans seem particularly deserving of attention, as capable of acclimatization in Britain, and probably of domestication.

TRAIN, GEORGE FRANCIS, b. Boston, 1830; merchant in Boston and in Australia, where he established the house of Caldwell, Train & Co.; went to England in 1860, and undertook to form street-railway companies in Birkenhead and London, but his plans were obstructed by legal opposition. He returned to this country in 1862. He has traveled extensively and addressed large audiences of laboring men, trades-unions, etc., in this country and in Europe. In 1837 he published *An American Merchant in Europe, Asia, and Australia*, and *Young America Abroad*. Collections of speeches followed; *Irish Independence* appeared in 1865, *Championship of Women*, 1868. He is marked for eccentricity.

TRAIN-BANDS (or more properly, TRAINED BANDS), a force of militia, and not differing essentially from that force, substituted by James I. for the old English fyrd, or national militia. The train-bands of London were chiefly composed of apprentices; and their unruly doings formed the subject for many facetious plays and tales. In the civil wars, the train-bands sided with the parliament; and Charles II. restored the militia on its old local footing.

TRAINING, applied in a sporting sense, implies the acquisition of the most vigorous and perfect health, and is used alike in reference to men, horses, and dogs. An individual is said to be trained "in condition," when he has by certain processes rendered his frame as fit as it is possible for it to be, for performing some feat of strength or endurance—such as undergoing a pugilistic encounter, a wrestling match, or a trial of speed, or any other prolonged exertion. To accomplish this end, a long course of training is often gone through, in many instances of a very severe nature. It being necessary to divest the muscles of every particle of fatty tissue which can possibly be got off without direct injury to the health, it often happens that many pounds of flesh are required to be dispersed, and the most severe and continued exertion, the body being wrapped in thick suits of flannels, denominated "sweaters," is necessary. Constant hard and sharp exercise in this fashion, combined with rigid abstinence, and a strict regard to other established laws of the art, are a *sine quâ non* in getting the body into the height of condition. For example, however thirsty the person training may be, after perhaps ten miles' rapid walking in a triple suit of sweaters, he must drink but very sparingly, for although he may have taken off pounds of flesh by profuse perspiration, one glass of ale would undo the whole effect. Great attention to diet is necessary. Indeed, much of the system may, as a modern writer has aptly expressed it, be laid down in the resolute performance of the three cardinal virtues—temperance, sobriety, and chastity. Almost

the same course is pursued toward animals; and whether for hunting or racing, horses and dogs have to submit to a course of training to bring them into condition. Lately, the Turkish bath, as a means of procuring the necessary reduction flesh without such excessive labor, has been found a most efficient ally in training. Out of condition, the muscles are flabby, confused, and coated with fat; the skin dead and lifeless; the eye dull and heavy; the lungs laboring, and the movements slow. In condition, the muscles stand out hard, clear, and defined; the tendons show like cords; the skin is clear and ruddy; the eye bright; the lungs play with unrestrained freedom; and the whole frame is endued with vigor and perfect activity. Animals, from their less artificial existence, require far less training than men to bring them into condition.

TRAJAN'S COLUMN, a celebrated column at Rome, which was reared 114 A.D., by the Roman senate and people, in honor of the emperor Trajan. It is considered not only the greatest work of its architect, Apollodorus, but one of the noblest structures of its kind ever erected. The pedestal is covered with bas-reliefs of warlike instruments, shields, and helmets; and a very remarkable series of bas-reliefs, forming a spiral round the shaft, exhibits a continuous history of the military achievements of Trajan. These are in excellent preservation, and, independently of their beauty as works of art, they are invaluable as records of ancient costume. A spiral staircase in the interior of the column leads to its summit. The height of the entire column is 132 feet. It still stands erect in all its ancient beauty amid the ruins of Trajan's forum. The summit was originally crowned by a colossal statue of the emperor, which has been incongruously replaced by one of St. Peter.

TRAJAN'S WALL, a line of fortifications stretching across the Dobrudscha from Czernavoda, where the Danube bends northward, to a point of the Black sea coast near Kustendji. It consists of a double, and in some places a triple, line of ramparts of earth, from 8½ to 11 ft. in height on the average (though occasionally it attains an altitude of 19½ ft.), bounded along its n. side by a valley, which, being generally marshy, and abounding in small lakes and pools, serves admirably the purpose of a fosse. This valley was long erroneously supposed to have been at one time the channel by which the Danube emptied itself; and a scheme for utilizing it by the construction of a canal to provide a more commodious water-communication with the Black sea, in lieu of the long and troublesome navigation by the Sulina mouth, has been frequently mooted, and is undoubtedly quite practicable; but the cost of the undertaking has hitherto been a bar to its execution. During the war of 1854 Trajan's wall became an important line of defense on the invasion of the Dobrudscha by the Russians, and the invaders were twice defeated in their attempts to pass it—at Kostelli (April 10) and Czernavoda (April 20 to 22).

TRAJANUS, MARCUS ULPIS, Roman emperor, was born at Italica (Alcala), near Seville, Sept. 18, 52 A.D. He was descended from a family which was probably of Roman origin, and was early trained to arms, becoming a prominently successful leader in the Parthian and German campaigns, during the reigns of Titus and Domitian. He was rewarded for his valuable services by promotion to the offices of pretor and consul (91 A.D.), and was ultimately adopted (97 A.D.) by Nerva (q.v.) as his colleague and successor. Trajanus became sole ruler in January of the following year, and celebrated the event of his accession by the usual largess to the soldiers, which gift his liberality prompted him to extend also to the Roman citizens and their children; and he made large provision out of the imperial treasury for the upbringing of the children of poor freemen in Rome and other Italian towns, with the view of encouraging the increase of the population. In 101 A.D., Rome, for the first time, beheld its emperor leading forth his legions in person on a career of conquest, when Trajanus set out on his first campaign against the Dacians who had exacted tribute from Rome since Domitian's time. The struggle was long and destructive; the emperor's opponents were valiant warriors, and headed by an able leader, their monarch, Decebalus; but the Romans at last gained a decisive superiority; and in a subsequent campaign (104 to 105) completely subdued their opponents, whose country thenceforth became the Roman province of Dacia, and was secured by partial colonization. This conquest, the first since the death of Augustus, was celebrated, on Trajanus's return to Rome, by a triumph, and by games on a most extensive scale, which continued for four months. Thirst for dominion again impelled Trajanus to the east in 106 A.D. Landing in Syria, he marched northward, received on his way the submission of numerous princes, possessed himself of Armenia, which he made a province of his empire, and hugely gratified the Roman senate with long lists of monarchs, never before heard of, who had bowed to their sway. The record of the events of the next seven years of Trajanus's reign is extremely defective, the few notices in Dion Cassius and others being insufficient for the construction of a consecutive narrative. In 115 A.D., he again set out from Syria, directing his march this time against the degenerate Parthian empire; took Ctesiphon almost without a struggle; and descending the Tigris, and subduing the tribes on both banks, became the first and only Roman general who navigated the Persian gulf. On his return, he found that, like the bent reed which recovers its position when relieved from pressure, the peoples of Mesopotamia, north Syria, and Arabia required to be again and more thoroughly subdued. This being done, and Parthia again conquered, Trajanus, sinking under a combination of dropsy and paralysis, which had long afflicted him, attempted to reach Italy, but was overtaken

by death at Selinus, in Cilicia, Aug., 117. Though most of Trajanus's reign was spent in the gratification of his warlike ambition, the internal administration was far from being neglected; the administration of justice was vigorous and impartial; that of finance was equally acceptable; informers (*delatores*) were severely punished, and peculating governors of provinces rigorously prosecuted. The improvement and beautifying of Rome—a favorite occupation of the emperors—was carried on: the empire was traversed in all directions by new military routes, canals and bridges were constructed, new towns built, the Via Appia was restored, the Pontine marshes partially drained, the magnificent "Forum Trajani" erected, and the harbor of Centum Cellæ (Civita Vecchia) constructed. Even if there were not abundant evidence of the sincere desire of Trajanus to increase the comfort and happiness of his subjects, the customary wish formally uttered on the occasion of an emperor's accession, that he might be "happier than Augustus, better than Trajan" (*Augusto felicior, Trajano melior*), would of itself suffice for proof. During Trajanus's reign, a persecution of the Christians, of a mild character, took place; and taking into account that Trajanus almost necessarily shared the general belief that Christianity was a perilous species of fanaticism, his conduct toward them deserves, perhaps, to be entitled to moderation.

TRAJECTORY, in mathematics, is any plane curve which cuts at a given angle a series of plane curves of the same species and having a common origin. In mechanics and astronomy, it denotes the path described by any body projected into space, and continuously acted upon by constant or varying forces; thus, the trajectory of a body projected obliquely for a little distance above the earth, is approximately a parabola (it would be accurately so, were space void, and the center of gravity of the earth infinitely distant), and the trajectories of the planets are approximately ellipses; the term, however, was long, in astronomy, exclusively applied to the paths of comets.

TRALEE, a sea-port and parliamentary borough of Ireland, chief t. of the county of Kerry, stands on the river Lee, about a m. from the point at which it enters the sea, 162 m. w.s.w. from Dublin, with which it is connected by the Great Southern and Western and Killarney railways. The pop. in 1871 was 9,506, of whom 8,563 were Roman Catholics, and 746 Protestants of the Episcopal church. The first origin of Tralee was due to the building of a castle, and the foundation of a Dominican convent by the Geraldine family, in 1213; and somewhat later a considerable house of the order of Templars was established. The borough is under the management of commissioners, who dispose of a revenue amounting to above £2,000. It returns one member to the imperial parliament. The t. is well built, and possesses many public buildings. A large traffic in grain and agricultural produce is carried on, the annual exports amounting to £200,000, and imports to about £150,000. There is a ship-canal, by which vessels discharge their cargoes close to the town.

TRALL, RUSSELL THACHER, b. Conn., 1812; studied medicine, but about 1840 ceased to prescribe drugs. In 1843 he began the supervision of a water-cure establishment, to which he afterward added a medical school for both sexes called the New York hygieio-therapeutic college. Among his numerous works are *Diseases of the Throat and Lungs*; and *The Scientific Basis of Vegetarianism*.

TRAM. See **SILK**.

TRAMMEL-NET, a kind of net resembling the drift-net used in the herring-fishery (q.v.), but anchored and buoyed at each end, the back-rope supported by small cork-floats, and the foot-rope kept close to the ground by weights. The length varies from 20 to 300 yards. A variety of trammel-net, chiefly used in the west of England and in Guernsey, consists of three long nets fastened together at top, bottom, and ends. The two outer nets are each five meshes deep, the meshes ten inches square; the middle net is twice as long and deep as the outer ones, but the excess at the edges is gathered in and united all round with the other nets. The outer nets stand with their meshes square and opposite one another, and a fish, in passing through the first net, meets the second or middle net—which, being slack, yields to the pressure—and is carried through the opposite large mesh of the third net into a loose bag or pocket, from which it cannot escape. This net is much used for taking red mullet, and in some parts of Cornwall is called a *tumbling-net*.

TRAMPS. See **MENDICANCY**; **VAGRANTS**, *ante*.

TRAMWAY. See **RAILWAYS**.

TRANCE, or **MORBID SLEEP**, differs from natural repose in duration; in profound insensibility to external impressions; in following excitement and the exaltation of certain instincts, chiefly the religious and amative, rather than fatigue or exhaustion; and in being the concomitant or symptom of diseases of the nervous system. The attitude, aspect, lowered respiration, and circulation of the entranced, resemble those of the sleeper. But there are many exceptions to this observation. A girl who remained dormant for 13 years, although she grew from a child to a woman in that time, was corpse-like in appearance, had lock jaw, and there was all but a total suspension of the signs of life. But while an individual cannot be roused from this condition by the most powerful stimulants, an electric shock, or even, it is affirmed, by a surgical operation, thought

or dream goes on uninterruptedly, and is more continuous and coherent in character than what takes place in ordinary sleep. So connected and real do these visions appear to the ecstatic, that they are generally accepted as true events, revelations, or impressions, received during a brief visit to another world. Trance has occurred epidemically during periods of great religious fervor and superstitions; and whole classes of persons are described as having preached while asleep, in the insurrection of the Cévennes. A similar phenomenon was observed in 1865 in those affected by hysteromania at Morzine, in Savoy. The affection has been divided, according to the intensity of the symptoms, into (1) *death-trance*, where neither the heart nor lungs act; where the temperature of the body falls; where no sustenance is taken, and the inner dream-life is the only vestige of vitality. Engelbrecht, who was subject to trance, wrote a book descriptive of this inner life, during which he believed himself to be transported to supernatural, if not to heavenly regions. (2) *Trance-coma*, where the breathing and action of the heart are feeble, but perceptible; the joints flexible; but where the external senses are not awake, and where the patient cannot be roused. (3) *Trance-sleep*, where, except in the insensibility to external stimuli, and in the length of the suspension of volition, little abnormal is noticed. As these states often succeed hysteria, nervous and other diseases, the bodies of the supposed dead are for a time, in certain countries, so placed as to be watched, and in circumstances favorable to resuscitation.—Mayo, *On the Truths contained in Popular Superstitions*, p. 88; Figuier, *Histoire du Merveilleux dans les Temps Modernes*, t. ii. p. 38; Dendy, *The Philosophy of Mystery*, p. 367.

TRANI, a maritime city of southern Italy, in the province of Terra di Bari, 25 m. n.w. of the town of Bari. Pop. '71, 24,338. It is surrounded by a wall with towers and moats, and entered by three gates. Trani is an archbishop's see, and has a handsome cathedral, convents, a court of appeal, a theater, and a strong castle. The streets are wide, well built, and paved with flagstones. There is a handsome square. A considerable trade in oil, wine, corn, and cotton, which last is also manufactured here, is carried on.

Trani comes first into notice when it submitted to the Normans in 1053. It was then the chief town of a vast county, and was an important harbor in the time of the crusades. Under the kingdom of Italy it has again begun to prosper, and promises once more to become an emporium of the commerce of the Levant, as it was in the middle ages.

TRANQUEBAR, a corruption of *Tullungambadi*, a sea port t. on the e. coast of British India, 155 m. s. of the city of Madras. It stands on a small bay, and is backed by a well-wooded and cultivated country; is a healthy station, much cooler than Madras, and has therefore been made a convalescent depot. The town is surrounded by walls, with bastions, and is further protected by the fort of Dansborg. The territory of Tranquebar embraces 15 sq. m., and produces rice, the cocoa-nut and other palms, the mango, and a variety of fruits. The town itself contains about 25,000 inhabitants. The territory passed finally into the hands of the English—the Danes having been its former possessors—in 1845.

TRANSCAUCASIA, the tract of territory belonging to Russia, and extending between the Caucasus (q.v.) on the n., and Turkey in Asia and Persia on the south. This name, however, has no practical geographical significance, as the Russians include the territory which it denotes in what they call the Caucasus, which is nominally included in European Russia, and comprises the governments Shemakha (q.v.), Tiflis (q.v.), Erivan, Derbent, and Kutais. The area of the Caucasus is 118,396 sq. m.; pop. '67, 4,661,824.

TRANSCENDENTAL—TRANSCENDENT (*transcendentalis, transcendens*), words employed by various schoolmen, in particular Duns Scotus, to describe the conceptions that, by their universality, rise above or transcend the ten Aristotelian categories (see CATEGORIES). Thus, according to Scotus, *ens*, or being, because it is predicable of substance and accident alike, of God as well as of the world, is raised above these by including or comprehending them; it has the same relation to the sum of the categories, as the *summum genus* to the various genera within a single category—relation (*summum genus*) to the classes of related things (included genera). Further, the predicates assumed by Scotus to belong to *ens*, or simple existence; viz., the one, the true, the good—*unum, verum, bonum*—are styled transcendental, because applicable to *ens* before the *descent* is made to the ten classes of real existence. In later times, since Kant, the word transcendental has been largely used as equivalent to the philosophical meaning of *à priori*. See COMMON SENSE, INSTINCT.

Between the hitherto convertible terms, transcendental and transcendent, Kant himself drew a distinction, of considerable importance in understanding his own system. By the word "transcendental" he designates the various forms, categories, or ideas assumed to be native elements of human thought; implying that, although they are not products of experience, they are manifested only in experience; such as space and time, causality, etc. The word "transcendent," Kant reserves for those among the transcendental or *à priori* elements that altogether transcend experience. They may seem to be given in experience, but they are not really given. Such are the "ideas of the pure reason," God, an immaterial soul, etc. Transcendental elements, when legitimately applied to experience, as causality and relation, are called immanent.

TRANSEPT, the projecting wings on the n. and s. sides of a church, forming the smaller arms of the cross, in the ground-plan of cruciform churches.

TRANSFERENCE, in the law of Scotland, means the step by which a pending suit is transferred from a person deceased to his representative.

TRANSFUSION OF BLOOD has been regarded as a recognized and legitimate operation in obstetric surgery since the year 1824, when Dr. Blundell published his well-known work, entitled *Physiological and Psychological Researches*. The operation had, however, been vaguely known to the medical profession for the last four centuries; and there are obscure allusions in the Roman poets, which would seem to indicate that it was practiced as early as the Augustan age:

Ut repleam vacuas juvenili sanguine venas.
Ovid.

The earliest authentic case on record is, so far as we know, that of pope Innocent VIII., who was unsuccessfully operated on in April, 1492. "The vital powers of Innocent VIII. rapidly gave way; he had for some time fallen into a kind of somnolency, which was sometimes so profound that the whole court believed him to be dead. All means to awaken the exhausted vitality had been resorted to in vain, when a Jew doctor proposed to do so by the transfusion, by a new instrument, of the blood of a young person—an experiment which had hitherto only been made on animals. Accordingly, the blood of the decrepit old pontiff was passed into the veins of a youth, whose blood was transferred into those of the old man. The experiment was tried three times, and at the cost of the lives of three boys, probably from air getting into their veins, but without any effect to save that of the pope."—Villari's *Life of Savonarola*. Although Libavius, in 1615, accurately describes the operation, there is no evidence that he ever practiced it. Passing over various experiments by Wren and Lower (both of Oxford) in the transfusion of blood from one animal to another, we find Denys of Montpellier, in June, 1667, injecting the blood of calves into the veins of a young man who had been much weakened, and had become torpid and slightly dropsical, in consequence of repeated bleedings. The first operation restored him to perfect health. Subsequent cases of his gave rise to a most virulent controversy, which ended with the decision, "that for the future, no transfusion should be made upon the human body but by the approbation of the physicians of the Parisian faculty." In November of the same year, Lower publicly made a similar experiment, which seems to have been successful; and in the following year Riva and Manfredi repeated the experiment in Italy. But the operation, although thus fairly started, soon fell into obscurity, doubtless from a want of success, due partly to the blood of calves and sheep, instead of human blood, being used, and partly to hopeless cases of old age and decrepitude being selected for its application.

At the present day transfusion is an operation which is almost always restricted* to cases of profuse hemorrhage in connection with labor; and as Dr. Playfair, in his excellent *Handbook of Obstetric Operations* (Lond. 1865), observes: "The benefits derived from it are probably twofold: 1. The actual restitution of blood which has been lost; and 2. The supply of a sufficient quantity of blood to the heart, to stimulate it to contraction, and thus to enable the circulation to be carried on until fresh blood is formed. Its stimulant action is probably of far the most importance, and if the operation is performed before the vital energies are entirely exhausted, the effect is most marked, and indeed may be said to be almost unailing."—Pp. 212, 213. Blundell was in error in believing that the blood of animals of the same species was essential; Dr. Brown-Sequard having since shown that the blood of various animals can be used indiscriminately, provided only certain precautions are taken; and the important † discovery has recently been made by Panum that defibrinated blood is in every respect as well suited for the operation as pure blood.

"The cases suitable for the operation," says Dr. Playfair, "are those in which the patient is reduced to an extreme state of exhaustion from hemorrhage during or after labor or miscarriage. The operation will not come into contemplation until other and simpler means have been tried and failed, and when symptoms indicate that life is on the verge of extinction." The value of the operation in suitable cases is proved by statistical evidence. Mr. Soden of Bath has recorded 36 cases, in 29 of which the patients were rescued from an apparently hopeless state; and out of 57 cases recorded by prof. Martins of Berlin, 43 were entirely successful, and 7 temporarily so. Of the various syringes that have been invented for this operation, Dr. Playfair gives the preference to that of Dr. Graff Hewitt. The blood to be injected should be taken from the arm of a strong and healthy man who can spare a sufficient quantity, since a change of persons leads to delay, and should therefore be avoided. Generally speaking, from four to six

* A case has lately been recorded in which it proved successful in a case of coma from the fumes of carbonic oxide and carbonic acid; and it is not improbable that it may again come into more general medical use.

† Dr. Markham has, we believe, suggested the trial of transfusion of blood in cases of the cattle disease. As it would be impossible, without danger, to bring a healthy animal in contact with a diseased one, the value of Panum's discovery, provided the proposed remedy be successful, is obvious. The blood of healthy oxen, killed for the market, could be defibrinated by whipping and straining, and would remain fit for injection, when raised to the normal temperature, for many hours.

ounces of blood are sufficient, but more may be required. It would be out of place to enter, in these pages, into details regarding the mode of performing the operation. They are fully described in Dr. Playfair's work.

TRANSIT-INSTRUMENT, one of the most important of astronomical instruments, consists of a telescope fixed to a horizontal axis, so as to revolve in the plane of the meridian, and is employed, as its name denotes, in the observation of the meridian transits of the heavenly bodies. The axis, which is the most important part of the instrument, and thus demands the utmost care in its construction, consists of a hollow sphere or cube, to opposite sides of which are tightly fastened the bases of two cones in whose apices the pivots are screwed; the sphere or cube is pierced for the admission of the telescope, which is firmly soldered at right angles to the axis. One of the pivots is hollowed so that a stream of light can be directed from a lantern half way along the interior of the axis, and through an aperture in the side, into the telescope tube, where, being received by an annular mirror, set at 45° to the axis and telescope tube, it is directed to the eye-piece, and brilliantly illumines the field of view, while the annular form of the mirror prevents any interference with the passage of rays from the object under observation to the eye. The pivots must be very carefully turned to a perfectly cylindrical form, and fitted into the instrument, so that their axis are accurately in line. One extremity of the axis carries one and sometimes two small graduated circles, each supplied with index, clamping screws, and vernier; these circles are capable of indicating angular measures to within $1'$ or $2'$. The pivots rest on massive blocks of stone or other stable material which is little affected by change of temperature, stability being the great mechanical essential of the instrument. This condition satisfied, there are three adjustments necessary before a transit can be observed; the axis must be horizontal; the line of collimation must be at right angles to the axis of motion; and the latter must be placed so as to point accurately e, and west. On the perfection of the first two of these adjustments depends whether the telescope sweeps over a great circle of the sphere, and the third is necessary to insure that this great circle shall be the meridian of the place of observation. These adjustments can never be made quite perfect, and the usual mode is to investigate the amount of error in each, and allow for it in the apparent result. To note accurately the instant of time by the astronomical clock at which the object (e.g., a star) is seen to pass the center of the field of view, is the essential part of a transit observation. The most effective method is to register the beats of the clock by an apparatus, which, at the end of each oscillation of the pendulum, marks a dot upon a uniformly moving slip of paper. This is effected by the agency of electricity, and is one of its most valuable contributions to astronomical science. At a certain point in each oscillation of the pendulum, it becomes part of a complete galvanic circuit, the contact being immediately broken by its progression in its oscillation; and it is at these points that the galvanic agency causes the dot to be made. The instant of a transit's occurrence is similarly noted by the observer, who, by a tap on a break-circuit key, fastened to the side of the transit-instrument, causes the graver to make an extra dot; and the distance of this dot from the previous seconds one, compared with the distance between two seconds dots, gives the time accurately almost to $\frac{1}{100}$ of a second. Various ingenious modes of registering have been proposed, all founded on the above principles. It is from the times of transit of the several heavenly bodies thus accurately observed, that their right ascensions are determined.

The transit-instrument was invented by Römer about 1690, and first described in 1700, in the *Miscellanea Berolinensia*, vol. iii. One was erected in Greenwich observatory by Halley in 1721; but it was little used till 1742. The present instrument in that observatory is by Troughton, and was erected in 1816.

TRANSITION, a term employed at first by Werner to designate rocks having a mineral character intermediate between the highly crystalline or metamorphic rocks and ordinary sedimentary deposits. As these rocks, in the region where the Wernerian classification originated, had a definite relation to the inferior and superior strata, and contained a uniform series of fossil remains, the term gradually came to have a chronological meaning. It was employed to designate similar deposits wherever they occurred. But a more enlarged view of the sedimentary deposits in the different countries of Europe, exploded the idea of a transition either in mineral structure or organic contents being characteristic of any set of beds, and caused the transition series to be more accurately classified as Cambrian, Silurian, and Devonian strata.

TRANSITORY ACTION, in the law of England, is used, in contradistinction to local action, to denote that the particular action may be tried in another county than that in which the occurrence arose.

TRANSLATION OF MINISTERS, in the law of Scotland, means the removal of a minister from one parish benefice to another.

TRANSLEITHANIA, a division of the Austro-Hungarian monarchy lying e, of the Leitha river, and including Hungary proper, Transylvania, Croatia, and Slavonia, and the military frontier. There is a regal government in many respects independent of the imperial rule.

TRANSMIGRATION, or the passing from one place, state, or condition into another, means, in the theological acceptance of the term, the supposed transition of the soul after death into another substance or body than that which it occupied before. The belief in such a transition is one of the most important phases in the religions of mankind. It was common to the most uncivilized and the most civilized nations of the earth; it was the object of fantastical superstition, as well as that of philosophical speculation, and it is the property of both ancient and modern times. Its basis being the assumption that the human soul does not perish together with the body, it could belong to those nations only which had already conceived an idea of the immortality of the soul; but in proportion as such an idea is crude or developed, as it is founded merely on a vague fear of death, and a craving for material life, or on ethical grounds, and a supposed casual connection between this and a future life, the belief in transmigration assumes various forms, and influences more or less the actions of men.

The lowest forms of this belief are probably those met with among several tribes of Africa and America, which hold that the soul, immediately after death, must look out for a new owner, and, if need be, enter even the body of an animal. Several negro tribes entertain this belief; they assume that the soul will choose with predilection the body of a person of similar rank to that of its former owner, or a near relation of his; and they frequently therefore bury their dead near the houses of their relatives, in order to enable the souls of the former to occupy the newly-born children of the latter, and the princely souls to re-enter the princely family; and until the soul is thus accommodated, milk, brandy, and food are placed on the grave of the deceased, to keep it, as it were, from starving; and sometimes holes are dug in the grave to facilitate the soul's egress from it. In North America some tribes slaughter their captives to feed with their blood such souls in suspense. The negro widows of Matamba are especially afraid of the souls of their husbands, for at the death of these they immediately throw themselves into the water, to drown their husbands' souls, which otherwise, as they suppose, would cling to them. The natives of Madagascar seem to have invented a kind of artificial transmigration, for in the hut where a man is about to die, they make a hole in the roof, in order to catch the outgoing soul, and to breathe it into the body of another man on the point of death. From these and instances of a similar kind, it will be seen that nations which entertain such a belief in transmigration, assume that the souls of the deceased must continue to dwell upon earth, and that one human being may be possessed of several souls. With them, the final destination of the soul is a matter of comparative indifference; its transition from one body into another a mere matter of chance, devoid—apparently, at least—of any ethical principle, and therefore without any moral effect on the living, except, perhaps, that of a stolid indifference to death, as often manifested in the plantations of the West Indies, where negroes hang themselves, in the belief that their souls will migrate into other countries, and there enjoy a happier life.

Another, more poetical, and in some respect also, more ideal form of this belief in transmigration, is that which occurs in Germanic mythology, and is still entertained in some parts of Germany and England. According to it, the soul, before entering its divine abode, assumes certain forms, or animates certain objects, in which it lives for a short period. Thus, it is supposed to enter some flower or tree, a rose, a vine, a plantain, a pine-tree; or to animate a butterfly, a pigeon, and sometimes also—if a person dies while enchanted or sleeping—a serpent, a weasel, or a mouse. The most popular form of these supposed transmigrations, however, is that of a pigeon, a representation of which bird, therefore, often occurs on the oldest tombstones. When the robber Madej, for instance, under an apple-tree confessed his crimes, one apple after another, transformed into a white pigeon, flew into the air. They were the souls of the persons murdered by him; only one apple remained, because he had not yet confessed the murder of his father; but when he did so, the last apple also—the soul of his father—assuming the shape of a gray pigeon, flew after the rest.

Different from this kind of belief in transmigration is that which is based on ethical grounds. It proceeds from the theory, that the human souls, being of divine essence, are originally pure, but during their earthly career, lose of their purity; being destined, however, to regain their original quality, are reborn again and again, until they have become free from fault, and thus worthy of re-entering the place of their origin.

A belief of this nature was entertained by the old Mexicans, and probably also the Druids. It is met with in a more developed form with the old Egyptians; but its real importance it obtained as a tenet of the religion and philosophy of the Brahmanical Hindus and the Buddhists, whence it passed into the doctrine of several philosophers of ancient Greece, and into that of some Jewish and Christian sects.

The ethical and philosophical value which such a belief may have, is necessarily relative. It will depend on what a religion or philosophy may call right or wrong, virtue or sin; it will likewise depend on the notions which religion or philosophy may entertain on the origin of the human soul, on the cause of its first birth, and on its ultimate destination, whether this destination is the merging of the soul into the essence of its creator, or a personal immortality; and again, the mode in which such a personal immortality is conceived will also necessarily influence the mode in which transmigration is supposed to take place.

Where the ideas on these questions have remained crude, the idea of transmigration,

too, is but of little ethical or philosophical worth. The old Mexicans imagine that the gods *Ometecuelli* and *Omecihuatl* create in heaven the soul of a child destined to be born, and that by its acts on earth it will either ascend to the abode of the highest felicity, or remain in an intermediate heaven, or fall to hell. The highest goal, situated in the house of the sun with the god *Huitzilopotehli*, is full of pleasure and joy, and is attained merely by the souls of fallen warriors, or those who died in captivity, and women dying in childbirth. The second or intermediate heaven, cool and pleasant, but of moderate enjoyments, falls to the lot of men who are not wicked. The wicked, however, go to the abode of darkness; and in darkness consists their punishment. But those entitled to the second heaven may, if they like, also return to earth, in order to qualify themselves for the highest heaven, if such is their aspiration.

Of the Druids, it is told by classical writers that they believed in the immortality of the soul, and in its migration after a certain period subsequent to death. Little is known of the manner in which they imagined such migrations to take place; but to judge from their religious system, there can be no doubt that they looked upon transmigration as a means of purifying the soul, and preparing it for eternal life.

According to the doctrine of the old Egyptians, the human race originated after the pure gods and spirits had left the earth; and this they did because the demons, who inhabited the earth, had revolted against them, and therefore tainted it with guilt. But, in order to enable the demons to purge themselves of their guilt, the gods created earthly bodies, which the demons were sentenced to animate, so that by expiations they might regain their state of original purity. And these earthly bodies, united to the demons, are the human race; their souls were therefore created at the same time as that of the gods; and human life—the connection of body and soul—is merely intended as a means of purifying the soul, which had rebelled against its divine nature. All the precepts regulating the course of life are laid down by the Egyptians for this end; and the judgment passed after death, in the palace of Osiris, decides whether it has been attained or not. If it has not, the soul must return to the earth again, to renew its expiations; and according to the nature and measure of the guilt which it had contracted during its previous career, it must form a new union with a human body, or with the body of an animal, or even a plant. But if the soul is declared pure by the judge of the dead, it gradually ascends through the various regions of heaven, to the highest abodes of the gods and pure spirits, presided over by Ptah and Neith.

At the time when in *India* the dogma of transmigration became an integral part of the Brahmanic religion, the Hindus believed that the human souls emanated from a supreme being, which, as it were, in a state of bewilderment or forgetfulness, allowed them to become separate existences, and to be born on earth. The soul, thus severed from the real source of its life, is bound to return to it, or to become merged again into that divine substance with which it was originally one; but as its nature becomes contaminated with sin through its earthly career, it must, so long as it remains in this world, endeavor to free itself from all guilt, and thus to become fit for its ultimate destiny. Religion teaches that this is done by the observance of religious rites, and a life in conformity with the precepts of the sacred books; philosophy, that the soul will be reunited with Brahman, if it *understands* the true nature of the divine essence whence it comes. So long, therefore, as the soul has not attained this condition of purity, it must be born again, after the dissolution of the body to which it was allied; and the degree of its impurity at one of these various deaths, determines the existence which it will assume in a subsequent life. See *INDIA*, sec. *Religion and Philosophy*; and *UPANISHAD*.

Since there can be no proof of the soul's migrations, the detail in which these are described in the religious works of the Hindus, is merely fantastical, and interesting only so far as it affords a kind of standard by which, at various epochs, and by different writers, the moral merit or demerit of human actions was measured in India. Thus, Manu (in the 12th book of his code of laws) teaches: "The slayer of a Brâhman'a—according to the degree of his guilt—is reborn as a dog, a boar, an ass, a camel, a bull, a goat, a sheep, a stag, a bird, a Chândâla, or a Pukkasa. A Brâhman'a, who drinks spirituous liquor, will migrate into the bodies of a worm, an insect, a grasshopper, a fly feeding on ordure, or some mischievous animal. A twice-born who steals (the gold of a Brâhman'a), will pass a thousand times into the bodies of spiders, snakes, and chameleons, of aquatic monsters, or of murderous bloodthirsty demons. He who violates the bed of his guru, will a hundred times migrate into the forms of grasses, of shrubs, and of creeping plants, of carnivorous animals and beasts with long teeth, or of cruel brutes. Those who inflict injury (on sentient beings), become flesh-eaters; and those who eat forbidden things, worms. Thieves become devourers of each other; and those who embrace women of the lowest castes, become ghosts. . . . If a man, through covetousness, has stolen gems, pearl, or coral, or whatever belongs to the precious substances, he is reborn in the tribe of goldsmiths; if he has stolen grain, he becomes a rat; if kânsya (a composition of zinc and copper), a *hansa* bird; if water, a diver; if honey, a gadfly; if milk, a crow; if juice (of the sugar-cane or the like), a dog; if clarified butter, an ichneumon; if flesh, a vulture; if fat, a shag; if oil, a cockroach; if salt, a cricket; if curds, the crane, called valâka;" etc. A more general doctrine of the migration of souls is based by Hindu philosophers on the assumption of the three cosmic qualities of *sattwa*, i.e., purity or goodness; *rajas*, i.e., troubledness or passion; and *tamas*, i.e.,

darkness or sin, with which the human soul may become endued. And on this doctrine, again, Manu and other writers build an elaborate theory of the various births to which the soul may become subject. Manu, for instance, teaches that "souls endued with the quality of *sattva* attain the condition of deities; those having the quality of *rajas*, the condition of men; and those having the quality of *tamas*, the condition of beasts." Each of these conditions, he continues, is, according to the acts or knowledge of the soul, threefold; the lowest, the middle, and the highest. "The lowest embodiment of the quality *tamas* is inanimate objects, worms, insects, fish, serpents, tortoises, tame and wild beasts; the middle state, to which the same quality leads, is (the state of) an elephant, a horse, a sūdra, a mlechha or barbarian, a lion, a tiger, and a boar; the highest, that of a public performer, a bird, a cheat, a demon called rakshas, and a vampire-demon. The lowest condition to which the soul imbued with the quality *rajas* arrives is that of a cudgel-player, a boxer, a public dancer, a man who lives on the use of weapons, and one addicted to gambling and drinking; the middle condition, that of a king, a man of the kshatriya or military caste, a house-priest of a king, and a man fond of learned controversy; the highest, that of a gandharva or musician in Indra's heaven, a gulyaka or yaksha (two kinds of attendants on the god of riches) or another attendant on another god, or an asuras or heavenly nymph in Indra's heaven. The lowest state procured by the quality of *sattva* is that of a vānaprastha—or a hermit of the third order of life—a religious mendicant, a Brāhmaṇa, or one of the demigods traveling about in palace-like cars, one of (the geni presiding over) the lunar man-ions, or an offspring of Diti. The middle state, procured by the same quality, is that of a sacrificer, a rishi (q.v.), a god of the lower heaven (a deity personating one of the) Vedas (a deity presiding over one of) luminaries or years, one of the manes or progenitors of mankind, and of the demigods called Sādhyas. The highest condition to which the quality of *sattva* leads is that of the god Brahmā, that of a creator of the world (as *Marichi*, or another patriarch of the same rank), that of the genius of Dharma (virtue or right), of *Mahat*, or the intellectual principle of creation, and of *Prakṛiti*, or matter." See SANKHYA.

It is not necessary here to show that this detail regarding the migrations of the souls is more or less differently given by other authors at other periods of Hindu religion, according to the views which they entertained of right and wrong, of the value and rank of imaginary or created beings, and of the social conditions of men. For, since all orthodox Hindu writers agree in principle with Manu, the quotations alleged from his work suffice to illustrate the imaginary positiveness with which the doctrine of transmigration was propounded, and to establish the conclusion that this doctrine rested in India on ethical grounds.

It has been already pointed out that the belief in the soul's life after the death of the body must precede the doctrine of transmigration. As such a belief, however, may be traced in some hymns of the *Rigveda* (see VEDA), it has been supposed that this doctrine, too, is as old as this Veda. But apart from the uncertainty which still exists regarding not only the age, but even the relative age at which the different hymns of the *Rigveda* were composed, and setting aside the fallacy which therefore attaches to speaking of this Veda as a contemporaneous whole, it is necessary to observe that the only passage which has been adduced in proof of this important discovery does not bear it out. It is the 32d verse of the hymn i. 164, and, according to the translation of prof. Wilson (vol. ii. pp. 137, 138), runs as follows: "He who has made (this state of things) does not comprehend it; he who has beheld it, has it also verily hidden (from him); he while yet enveloped in his mother's womb, is subject to many births, and has entered upon evil." But the word of the text, *bahuprajāh*, rendered by Wilson, according to the commentator, "is subject to many births," may, according to the same commentator, also mean, "has many offsprings," or "has many children;" and as the latter sense is the more literal and usual sense of the word, whereas the former is artificial, no conclusion whatever regarding the doctrine of transmigration can safely be founded on it.

The Buddhistic belief in transmigration is derived from that of the Brahmanic Hindus; it agrees with the latter in principle, though it differs from it in the imaginary detail in which it was worked out.

Like the Brahmanic Hindus, the Buddhists believe that all souls have existed from the beginning; like them, they believe in the unreality and sinfulness of the world, in the necessity of the soul's freeing itself from the bondage of this world, and in the casual connection between the actions of man in this, and his condition in a subsequent, life. Like the Brahmanic Hindus, they hold, therefore, that sin is the cause of transmigration, and that, by a total expiation of sin, the soul ceases to be reborn, and attains its final resting-place. But since this resting-place is to the Buddhists Nirvāṇa (q.v.), or non-entity, whereas to Brahmanism it is Brahman, or the principle of entity; since they reject the institution of caste, which is the social foundation of Brahmanic life; since they do not acknowledge the authority of the Vedas, and the codes based on it, and therefore consider as morally wrong much that the Brahmanic Sāstras enjoin as morally right, the standard according to which the life of a Buddhist is regulated must differ in many respects from that which governs the conduct of a Brahmanic Hindu; and his ideas of reward and punishment, therefore, as reflected by his ideas of the mode of transmigration, likewise differ from those of the Brahmanic believer. To enlarge here

on this difference is not necessary, for, after the illustrations already afforded from Manu, it is easy to conceive that the *detail* of the Buddhistic doctrine of transmigration is as fanciful as that of the Brahmanic doctrine; that it is therefore partly devoid of interest, and partly intelligible only if taken in connection with the detail of Buddhistic religion and literature (see *BUDDHISM*; also *LAMAISM*). Yet it is not superfluous to point out one great difference which separates the notions of one class of Buddhists from those of the rest, as well as from those of the Brahmanic Hindus. According to the latter, and the great mass of Buddhists, it is always the same soul which ever from its first birth reappears in its subsequent births, until it is finally liberated from transmigration. But among the southern Buddhists, another idea has also taken root. In their belief, the succession of existences of a being is also a succession of souls; and each such soul, though the result of its predecessor, is not identical with it. According to this view, the body dies, and with it the soul, too, is "extinguished," leaving behind only the good and bad acts which it has performed during its life. The result of these acts now becomes the seed of a new life, and the soul of this new life is therefore the necessary product of the soul of the former life. Thus all the succeeding souls have to labor at the solution of the same problem, which began when their first ancestor entered this world, but no succeeding birth is animated by the same soul. This dogma is illustrated in their works by various similes. One lamp, they say, for instance, is kindled at another; the light of the former is not identical with that of the latter, but nevertheless without this the other light could not have originated. Or, a tree produces fruit; from the fruit another tree arises, and so on; the last tree is therefore not the same as the first, though the fruit is the necessary cause of the last.

In Greece, the doctrine of transmigration—or, as it is there called, *metempsychosis*—did not become the belief of the people, but was confined to the teaching of the mysteries and the tenets of philosophers, who probably derived it, either directly or indirectly from Egypt or India. According to some, Thales (q.v.) was the first Greek philosopher who propounded it; according to others, Pherecydes (q.v.) the teacher of Pythagoras (q.v.) but its importance in Greek philosophy it first obtained through the system of Pythagoras, who, it seems, became acquainted with it through Egyptian sources. After him, it was Plato (q.v.) who assigned to it a prominent place in his philosophy; and he probably was indebted to Hindu writers for his views on metempsychosis, as explained in his dialogues, especially in *Phaedrus*. Plato's doctrine was refuted by Aristotle, but revived, though in a modified shape, by the Neoplatonists.

Since a belief that the consequences of the acts of man must follow their inevitable course, and can neither be averted nor stopped by the intercession of a divine power, is incompatible with a belief in divine grace, the doctrine of transmigration or metempsychosis could never gain a firm ground in the religion of the Jews and Christians. It deserves notice, however, that in both these religions it found adherents as well in ancient as modern times. Among the Jews the doctrine of transmigration—the *Gilgul Neshamoth*—was taught in the mystical system of the *Cabbala*, which pretends to divulge the secrets of creation and those of the nature of the divine and human soul. "All the souls," the *Sohar*, or the book of "light," the spiritual code of this system, says, "are subject to the trials of transmigration; and men do not know which are the ways of the Most High in their regard. They do not know how they are judged in all times, as well before they come to this world as after they leave it. They do not know how many transformations and mysterious trials they must undergo; how many souls and spirits come to this world without returning to the palace of the divine king." The principle, in short, of the *Cabbala* is the same as that of Brahmanism. The souls, like all other existences of this world, it teaches, must re-enter the absolute substance whence they have emerged. But to accomplish this end, they must develop all the perfections the germ of which is planted in them; and if they have not fulfilled this condition during one life, they must commence another, a third, and so forth, until they have acquired the condition which fits them for their reunion with God. On the ground of this doctrine, which was shared in by rabbis of the highest renown, it was held, for instance, that the soul of Adam migrated into David, and will come into the Messiah; that the soul of Japhet is the same as that of Simeon, and the soul of Terah migrated into Job. Generally, it was supposed by writers of this school, the souls of men are reborn in men, and those of women in women; but also the reverse takes place, as in the case of Thamar, who had the soul of a man, and in that of Judah, whose soul was in part that of a woman. And because Ruth had the soul of Thamar, she could not bear children until God imparted to her sparks of a female soul. If the soul of a man, however, is reborn in a woman, such a migration is held by some to be a punishment for the committal of great sins, as when a man refuses to give alms, or to communicate to others his wisdom. And it is by way of punishment, too, that the soul of a Jew is reborn in a heathen or in an animal—a clean or unclean beast, a bird, a fish—or even in an inanimate object. Of all these transmigrations, biblical instances are adduced—according to their mode of interpretation—in the writings of rabbi Manasse ben Israel, rabbi Naphtali, rabbi Meyer ben Gabbi, rabbi Ruben, in the *Jalkut Khadash*, and other works of a similar character. Modern Cabbalists—for instance, Isaac Loria—have imagined that divine grace sometimes assists a soul in its career of expiation by allowing it to occupy the same body together with another soul, when both are to supplement each other, like the blind and

the lame. Sometimes only one of these two souls requires a supplement of virtue, which it obtains from the other soul, better provided than its partner. The latter soul then becomes, as it were, the mother of the other soul, and bears it under her heart like a pregnant woman. Hence the name of gestation or impregnation is given to this strange association of two souls. That all these wild fancies have for their main object the explanation of obscure or mystical passages of the Bible, and the reconciliation of such as are or may seem contradictory, requires no remark; the philosopher, however, must look to their basis, which is purely ethical.

Among the early Christians, St. Jerome relates, the doctrine of transmigration was taught as a traditional and esoteric one, which was only communicated to a selected few; and Origenes, like the Kabbalists, considers it as the only means of explaining some biblical traditions, as that of the struggle of Jacob and Esau before their birth, or the selection of Jeremiah when he was not yet born, and many more events which would throw discredit on divine justice, unless they were justified by good or bad acts done in a former life. Of Christian sects the Manichæans (q.v.) especially adhered to this belief, but the church always rejected it as a heresy.

In concluding, at least one great philosopher of modern times may here be named as one whose views of the progress of mankind are based on the same doctrine; it is the celebrated German critic, G. E. Lessing, who endeavored to establish it on metaphysical grounds. His arguments are briefly these: The soul is a simple being, capable of infinite conceptions. But being a finite being it is not capable of such infinite conceptions at the same time; it must obtain them gradually in an infinite succession of time. If, however, it obtain them gradually, there must be an order in which and a degree to which these conceptions are acquired. This order and this measure are the senses. At present the soul has of such senses five; but neither is there any ground to assume that it has commenced with having five senses, nor that it will stop there. For, since nature never takes a leap, the soul must have gone through all the lower stages before it arrived at that which it occupies now . . . and since nature contains many substances and powers which are not accessible to those senses with which it is now endued, it must be assumed that there will be future stages at which the soul will have as many senses as correspond with the powers of nature. And "this my system," he concludes his little but important essay, *Dass mehr als fünf Sinne für den Menschen sein können*—in a fragmentary note discovered after his death—"this my system is certainly the oldest of all philosophical systems; for it is in reality no other than the system of the pre-existence of the soul and metempsychosis, which did not only occupy the speculation of Pythagoras and Plato, but also before them of Egyptians, Chaldeans, and Persians—in short, of all the sages of the east; and this circumstance alone ought to work a good prejudice in its favor, for the first and oldest opinion is in matters of speculation always the most probable, because common sense immediately hit upon it."

TRANSOM, a horizontal mullion or bar in a window, door, etc., chiefly used in late Gothic and Elizabethan architecture.

TRANSOMS, in artillery, the bars or bolts by which the two sides—technically called "checks"—of a gun-carriage are held together.—In a ship, beams across the sternpost, at right angles to that timber, fastened in the same way as the floors upon the keel.

TRANSPADANE REPUBLIC. See **CISALPINE REPUBLIC**.

TRANSPANTING—the removal of a growing plant from one situation to another—is much practiced with many kinds of cultivated plants which are reared in a nursery and *planted out*. Many flowers and culinary plants are generally treated in this way, as well as ornamental shrubs and fruit and forest trees. It is desirable to have a ball of earth attached to the roots in every case, although this is often neglected. It is also desirable to shade the plant and water it for a few days after transplanting when possible. Young plants are easily transplanted, as their roots not having spread far are raised from the ground without much injury, and this is the thing of first importance in the operation. At a more advanced age transplanting becomes difficult, great part of the difficulty, however, being mechanical. No plant can be transplanted with safety when in flower or fruit; the plant may live, but the flowers or fruit will almost certainly perish. In like manner leaves often wither; and transplanting ought, if possible, to be performed in winter, when vegetation is least active.

The transplanting of large trees, in order to immediate effect in the neighborhood of a mansion, has been practiced for many years with success. Notwithstanding all the care that can be taken, the trees are *thrown back* for two or three years; but this in general is all the injury which they sustain, unless removed from a situation very different from that in which they are placed. It is of great importance in transplanting trees that they should be placed in their new situation in the same direction to the prevailing wind as in their former situation. This is often disregarded, and many failures are the consequence. It ought also to be borne in mind that trees taken from a thick wood and planted in a lawn, or along the sides of an avenue, cannot be expected to succeed there. They have neither roots nor branches adapted to their new situation, and suffer from unaccustomed exposure to wind and weather. Trees of quick growth, such as limes and poplars, succeed most readily when transplanted; oaks are particularly difficult. In every case, however, there is much hazard, because the roots of trees generally

spread far from the stem, and when the operation is unskillfully performed the principal roots are often cut off and the smaller ones torn by the violence, while all are injured by being laid bare. Trees thus treated seldom ever again assume a healthy appearance. The method is therefore now generally adopted of preparing the tree for transplanting by digging a trench around it at least two years beforehand, at such distance as is thought expedient, cutting the roots all round, except two or three which are left to hold the tree fast, and then filling up the trench with fresh soil of the best quality that can be procured, into which a vast number of young roots are speedily thrown out. When the tree is to be removed a new trench is made immediately on the outside of the former trench, and young roots sufficient for the nourishment of the tree are thus preserved. The ball of earth being generally too heavy for removal is reduced in size by a very careful picking away of earth, so that the rootlets shall be as little as possible injured or even laid bare. The tree is generally transported to its new situation by attaching it firmly to a pole fixed upon an axle with a pair of wheels, the ball resting upon the axle. Good soil is put into the pit dug for it, and the roots are spread out. The tree is stayed by sticks and ropes till it is well established, and heavy stones are also laid on the top of the ball, or large beams of wood are laid across it and firmly fastened to the ground at both ends. An improvement on this method has been effected by the use of a compost of vegetable mold, decayed leaves, etc., in preparing the tree for transplanting, not only in the trench dug around it, but on the top of the ball itself, so that the tree is encouraged to send out many new rootlets. A still greater improvement consists in the use of a machine by which a large ball of earth can be removed along with the tree, so that it is no longer necessary to pick away any part of the soil or to lay bare the young roots; while the tree being carried in a vertical instead of a horizontal position, all possibility of damage in this process is avoided. One of the machines used for this purpose consists of two pair of wheels about 15 ft. apart, each pair on a strong axle; the first pair smallest, and in a very large machine about $5\frac{1}{2}$ ft. in diameter; the second pair 7 feet. A strong frame rests on each axle to raise the horizontal bearers to a sufficient height. The front frame turns on a horizontal wheel, as in a carriage, for easy turning of the whole machine. Resting on the two frames are two strong horizontal beams of wood, above which are two short cross-beams with jack screws and strong chains for raising the tree. Beneath the roots and ball of earth when the tree is raised from the ground strong planks are placed, supported by chains from the beams. In order to raise the tree from its place a sloped cutting is made, and the tree is drawn gradually up the inclined plane.

TRANSPORT, MILITARY AND NAVAL. Without a powerful system of transport an army is helpless. To cross a sea a large fleet of vessels properly fitted for men and horses is requisite. When the English army of about 30,000 men crossed in 1854 from Varna to the Crimea, it took 600 vessels to carry them without any reserves of stores or food.

Not less important to the army moving by land is its transport. On entering battle infantry and cavalry usually carry three days' rations with them and 60 rounds of ammunition. The moment these are exhausted they become dependent on the transport department for their replenishment. The first reserves are immediately in rear. To bring up supplies from these, and to keep these reserves themselves supplied, is the duty of the military train (q.v.) as regards food, and of the field-train in respect of ammunition. Between the grand depot and the base the operation is generally intrusted to the wagons and beasts of the country, driven by natives, of course under proper military control. The amount of transport required by an army seems almost fabulous. The lowest computation must put one animal to four fighting-men. In addition to the transport of food and ammunition the wounded and sick have to be carried, both from the field to the hospitals and during a march.

In the British army the direction of the transport rests with the quartermaster-gen.; in the French army it is under the *intendant*, who is over all the administrative departments.

TRANSPORTATION, from the Latin for carrying across, means the removing of persons from one territory to another; and is thus distinguished from banishment, which is the mere driving of persons out of the country in which they live. Transportation, in this country, means a removal beyond seas, and has been in use to express the punishment of crime in that manner. The practice was known to the Romans; and transportation to Sicily will be found referred to in Cicero's charges against Verres. When the English monarchs had possession on the continent, there was much jealousy about their carrying off troublesome persons to these dominions, and thus bringing them under irresponsible power. The legal transportation of criminals from the British dominions began early in the 17th c., when they were removed to the plantations in America, and treated as slaves. This practice continued, under modifications, until it was stopped by the American revolution. Its unfitness as a punishment is obvious. The amount of infliction would depend, not on the extent of the criminal's guilt, but of his master's humanity. There were even worse evils, for young lads were kidnapped in Britain, and sold to the planters, and these victims were often unable to prove, even when they had an opportunity, that they were not legally transported for offenses. When this method

of getting rid of convicts ceased, there was great alarm that Britain would be overrun with crime, and it was hailed as a deliverance when the government resolved to establish a penal colony in Australia. The first convicts were conveyed thither in 1787. Such was the beginning of the famous colony of Sydney, or Botany Bay. Between the years 1820 and 1830, the system was at its full perfection; but though thousands were annually removed, crime did not appear to decrease. It was forgotten, that the predatory and fraudulent offenses, which are by far the greater number in this country, are trade as well as crime; and that where there is a large portion of the population, as there unfortunately is, prepared to have recourse to crime whenever it pays, the place of those removed is immediately supplied. When the criminals were sent to the antipodes, the mistake was made of supposing that they took the crime of the country with them, and that there was so much less need for precautionary measures at home. During thirty years, however, the greater proportion of the class of criminals who used to be transported, have been retained in this country, and liberated in it at the end of their punishment. This practice has been accompanied with two classes of precautionary measures—an improved police, and the reformation of juvenile delinquents. To these influences have been added free trade, and the consequence of all is, that crime is diminished to the extent of between a third and half of what it was 20 years ago. In 1838, a committee of the house of commons issued a celebrated report on the effect of transportation. It was shown to be still an extremely unequal punishment—in some instances giving rogues an opportunity of making their fortune, in other cases subjecting men less depraved, but more infirm in temper, to punishments of the most frightful kind. It was found to be accompanied by the prevalence of crimes which cannot be mentioned, and with a vast amount of general demoralization in the convict settlements. Yet it was found not to have much terror for the criminal classes, who heard more about the success than the hardships of transportees. In 1840, transportation to New South Wales came to an end; and by a succession of statutes, sentences to penal servitude were substituted for sentences to transportation. In 1858 transportation to western Australia also wholly ceased, to the great benefit of the whole continent. The practice of transportation cannot, it will be easily understood, be carried out by governments which have no colonies, though Russia manages it by possession of the desolate region of Siberia. It is a curious circumstance that the practice began in France just as this country was abandoning it.—See CONVICT, PENAL SERVITUDE, PRISON DISCIPLINE, TICKET OF LEAVE.

TRANSPOSE, in music, is to change a piece of music in performance from the key in which it is written to another key. To play at sight an accompaniment for such an instrument as the pianoforte or organ, transposed from one key to another, requires considerable artistic skill. To the singer, transposals presents no difficulties.

TRANSUBSTANTIATION (Lat. *transubstantiatio*, change of substance, from *trans*, over, and *substantia*, a substance), a word used by the scholastic writers of the Roman Catholic church to designate the change which is believed by Roman Catholics to take place in the Eucharistic elements of bread and wine, in virtue of the consecration. Under the head **REAL PRESENCE** (q. v.), which is often loosely comprehended under the larger name of transubstantiation, the doctrine of Catholics as to the presence of the body and blood of Christ in the Eucharist, after consecration, has been fully explained. There remains, however, beyond this doctrine as to the presence of Christ, a further inquiry concerning the elements of bread and wine which had existed in their natural condition before the consecration. For sacramentarians (q. v.), this question is easily resolved. But those Protestants who hold in common with Catholics the reality of Christ's presence, differ from them as to the copresence of the substance of bread and wine after consecration. Some Anglican divines, who hold the real presence of the body and blood, would appear to content themselves with remaining silent as to the mode of the presence. Dr. Pusey goes so far as to say, that the dispute between Anglicans and Romanists is "probably a dispute about words" (*Eirenicon*, p. 229). The Lutheran views as to the mode of the presence have been explained under the heads **IMPANATION**, **REAL PRESENCE** (q. v.). According to the Catholic doctrine, which has been explicitly defined as an article of faith (Council of Trent, Sess. xiii. Can. 2), "the whole substance of the bread is changed into the body of Christ, and the whole substance of the wine into His blood, the species alone remaining." What is the precise philosophical meaning of the word "species," called also "accidents," in this definition, is not declared; but in popular language it may be described as simply meaning the appearances, that is to say, those qualities or conditions of bread and wine which produce upon the senses the impression of the presence of bread and wine. It is not taught, however, that in the change called transubstantiation, the body and blood of Christ are formed out of the substance of the bread and wine, but that, in virtue of the Eucharistic consecration, the substance of bread and wine cease to exist, and that the body and blood of Christ take their place; nor that the body and blood of Christ become what the schoolmen call the "subject" of the "accidents" of the bread and wine, but merely that, by a miraculous suspension of the ordinary law, the senses still continue to receive from the Eucharistic elements all the same impressions which they had previously received from the bread and wine: viz., of color, taste, smell, solidity, extension, figure, etc.

The history of the controversy regarding transubstantiation is sketched in the article LORD'S-SUPPER. The objections to the doctrine have been chiefly drawn from the philosophical difficulties which are involved in it: and the defenders of it have, for the most part, contented themselves with resting on the proofs which they profess to draw from Scripture and tradition, and a general demonstration that the doctrine, although mysterious, does not involve any philosophical repugnance or impossibility, and that the philosophical arguments against it are at least not conclusive. Some Catholic philosophers have even undertaken to demonstrate the possibility of transubstantiation by philosophical arguments; and it is especially remarkable that the celebrated Leibnitz (q.v.) has not only entered at great length, and in several portions of his works, into this philosophical discussion, but professes to prove, by strict philosophical principles—by the consideration of the properties of matter, of substance, of space, extension, and the like—that the essential principle of the body “may exist in many places at the same time, nay, under far-distant and distinct species.”—Leibnitz's *Deutsche Schriften*, i. pp. 283, 284.

TRANSVAAL (i.e., “across the Vaal”), till 1877 a republic, now a British territory, in s.e. Africa, includes the country n. of the Vaal river, and on both slopes of the Magaliesberg or Cashan mountains, into which the emigrant Boers retired after the annexation of the Orange River Free State, in 1848, to the British crown. Its limits lie between lat. 22° and 27° s. and long. 25° and 32° east. The n. boundary of the republic may be described as formed by the Oori or Limpopo river, here running nearly from w. to e.; its e. boundary by the continuation of the Drachenberg mountains, separating it from the coast-region, inhabited by the Zulu Kaffirs; on the s. it has the Vaal river from its source, dividing it from the Free State republic; while on the w., an undefined line separates it from the Betjuana tribes, still independent, living along the edge of the desert region of the Kalihari. Thus, an area of not less than 114,000 sq. m. was more or less under the control of the emigrant Boers, who were not very scrupulous in their dealings with the poor native tribes who lived, or live still, in the country they now occupy. This region may be described in general terms as a vast plateau, sloping to the n., supported by the coast-line of mountains, which, presenting a bold mural buttress, or escarpment, to the low country at their feet, stretch away on their western flank into vast undulating plains. At right angles to the coast-range, another belt of very high lands, called the Magaliesberg, runs e. and w., forming a watershed between the river-system of the Vaal or Orange and Limpopo rivers. The southern face of this range also presents long and undulating plains, generally well watered and wooded, and abounding with large game. To the n., as we approach the basin of the Limpopo, many high parallel chains of hills are met with, through narrow *poorts* or openings in which flow the many streams which form, further to the northwest, the Limpopo or Oori river, which is supposed to enter the ocean as the Sabia, in lat. 20° 43' s., long. 34° 30' east. This point, however, is still one in dispute with African geographers. See **SOFALA**. The rivers of the Transvaal region are more generally applicable for irrigating purposes than those of the Free State or Cape Colony in general, their channels not lying so deep below the general surface of the country.

The average height of the plateau inhabited by the emigrant farmers of European descent is from 4,000 to 5,000 feet. Many of the peaks of the mountain range traversing the plateau attain an elevation of 9,000 or 10,000 ft., and are covered with snow some months in the year. The altitude of the coast-line of mountains is considered at from 6,000 to 7,000 ft. above the low region at their feet.

The principal towns are—Moorivervorp, or Poteschefstroom, on the Mooi river; Pretoria, about 100 m. n.e. of Poteschefstroom, the seat of the local government; Leydenburg, 170 m. n.e. of Pretoria; Rustenberg, a few m. n. of the Magaliesberg; and Zoutpansberg, the most remote village inhabited by men of European descent in s. Africa, about 40 m. s. of the Limpopo river.

The population consists of emigrant farmers, and a mixture of deserters and foreign refugees from the Cape Colony and Natal. Their number is about 40,000 souls. Scattered through the country are numerous kraals of Betjuans, in number about 650,000, whom the Boers have hitherto compelled to supply labor whenever required. The republic was established in 1840, and recognized by Britain in 1852. The budget for the year ending Jan. 31, 1876 gave the revenue at £86,496. According to a treaty entered into between Portugal and the Transvaal republic, the latter enjoyed free transit of all goods through the Portuguese harbors on the e. coast; and in order to save the import dues levied by the colony of Natal, industrious efforts were made to secure direct access, by road and rail, to Delagoa bay. As this line passed through the dominions of an independent chief, the Boers were soon embroiled in desultory war with the latter. Their policy further provoked so intense excitement among the natives upon the Kaffrarian frontier of the Cape Colony, and so seriously menaced the well-being of the British settlements, that Britain interfered, and ultimately, on April 12, 1877, annexed the territory of the republic. A large measure of local freedom is enjoyed by the Boers, and Dutch ranks with English as one of the two official languages. Chief exports—ostrich feathers, wool, ivory, cattle, cereals, tobacco, etc.

With regard to the social aspect of the country, very marked progress has been made

within the last few years. The large influx of Europeans and colonists of a more educated class than the original settlers, has produced very marked effects. The state church has been the Dutch Reformed, but all other creeds are tolerated.

The climate is generally healthy, although n. of the Magaliesberg its tropical nature begins to manifest itself. Hot winds and violent thunder-storms prevail in the summer months. The fly *tsetse*, whose bite is death to the bovine and equine species, abounds in many parts, and renders traveling with oxen and horses difficult.

When capt. Harris visited this region 40 years ago, the number of the larger mammalia found by him was enormous; and even Gordon Cumming, who hunted over part of it many years subsequently, found them still numerous. Crocodiles are numerous in the rivers, and a large species of boa is found.

The first diamond discovered in s. Africa was found in Oct., 1866, n. of the Vaal river, and since then diamond mining has been carried on with great success in that district. Diamonds have also been found in the districts of Marico, Waterberg, and Pretoria. Gold has been discovered in quartz reefs and alluvial deposits near Marabastad, 180 m. n. of Pretoria; also near Leydenburg, where mining is actively prosecuted; and the gold-bearing strata are supposed to extend for hundreds of m. in various directions. The country is also rich in other minerals, such as copper, lead, iron, tin, and coal.

TRANSVAAL (*ante*), was occupied by the Dutch Boers who left the Orange Free State after its annexation by the British in 1848. They established a republic which became prosperous: their independence was acknowledged by England in a treaty, 1852, and recognized by five European courts, also by the United States. But the English government, during the late Zulu war, annexed their territory to the British empire under the Cape Colonial government, 1877. The people protested, sent a commission to England to ask for justice, which was not allowed to present its case. They then took up arms to maintain their independence; 5,000 Boers took possession of Heidelberg in Transvaal, and re-established the republic, with Paul Kruger, president. Feb. 27, 1881, the Boers attacked the British forces on Majela mountain, and, after eight hours' severe fighting, drove them from their point. The British commander was killed, and out of 22 officers and 627 men only 100 escaped. After this battle an armistice took place pending the settlement of the question at issue.

TRANSYLVANIA (called by the Hungarians *Erdély-Ország*—Walach, *Arja*!—"the woody and mountainous country;" by the Germans *Siebenbürgen*, "seven castles," from the seven forts built by the Saxons on their establishment in the country, and which forts became nuclei of the walled cities of Hermannstadt, Klausenburg, Kronstadt, Bistritz, Mediasch, Mühlenbach, and Schäßburg; and by the Romans *Transylvania*, from its position *beyond* the forest range which stretches southward from the Carpathians, and forms its western boundary) is the most easterly territory of Austria, and is bounded on the n. by Hungary and Galicia, e. by Bukovina and Moldavia, s. by Wallachia, and w. by the Military Frontier, the Banat, and Hungary. It contains 21,134 Eng. sq.m., with a pop. '69, of 2,115,024, of whom 1,200,400 were Wallachs and eastern Romans, 573,000 Magyars and Szeklers, 225,000 Germans, the rest being slaves, gipsies, Armenians, Jews, Italians, etc. Classified according to their religious professions, 652,945 were non-united Greeks, 600,800 Greek-Catholics and Armenians, 505,540 Protestants, 263,769 Roman Catholics, and 24,848 Jews. Transylvania is an elevated plateau (it lowest parts being 530 feet above sea level) of an irregular form, somewhat resembling a triangle of which the upper part has been irregularly removed, and is bounded partially on the n., and wholly on the e. and s., by a high range of mountains—a continuation of the Carpathians—which sends out innumerable lateral ridges toward the center of the country, and along the western frontier, so that Transylvania is an almost perfect natural fortress. There are no plains except where a river-basin widens out; but the valleys are numerous and exceedingly picturesque. Almost the whole country is drained westward into the Danube, by the Theiss and its feeders in the n., and by the Maros, a tributary of the Theiss, and its feeders, in the center and s.; the south-eastern corner is drained by the Aluta, or Alt, which, after a winding course, breaks through the southern bounding range near Hermannstadt; while a number of streamlets worm their way through the eastern range, and join the Sereth. The climate is more healthy and temperate than that of Hungary, the mountain-chain along the southern frontier keeping off the hot winds. The soil is extremely fertile; but much arable land is still uncultivated. The valleys and hill-sides supply abundant pasturage for numerous herds of cattle and droves of horses; the cultivated districts yield good crops of maize, rye, barley, oats, all sorts of leguminous plants, tobacco, saffron, madder, hemp, and flax. The culture of fruits is extensively practiced, and immense quantities of apricots, peaches, plums, apples, pears, and walnuts are annually produced. The extensive forests, which cover nearly 5,300,000 acres of ground, contribute largely to the wealth of the country. The vine is extensively cultivated, and, in spite of the defective mode of preparation, the produce is excellent in quality. The mineral wealth of Transylvania is great; gold is found more abundantly than silver, and silver than copper; yet there are few gold mines regularly worked, and a thorough investigation of the extent to which this valuable metal exists in the country, seems never to have been made. Iron is found in abundance at Torockzo, copper at Balan, lead at Rodna; the other minerals

are mercury, manganese, antimony, sulphur, arsenic, vitriol, alum, marble, etc. Coal is not absent; but firewood is so abundant and cheap that no other combustible has been sought for; and even the extensive tracts of peat have been allowed to lie undisturbed. Rock-salt is abundant. Transylvania has almost no manufactures, and the commerce, owing to the isolation of the country, the want of enterprise of its inhabitants, and the absence of good roads, is far from bearing a fair proportion to the amount of the country's produce.

Of the various races which now inhabit Transylvania the Walachs, the earliest possessors, though by far most numerous, were till recently subordinated to the other races of Transylvania, but since the revolution of 1848-49 have acquired a position in the country which, by all means, honest or dishonest, they are striving to improve; the Magyars entered as conquerors in the 10th c., and still constitute the nobility and gentry of the land; the Saxons were introduced in 1143 and 1247 from the Rhenish provinces of Lower Saxony by king Geysa II. and Bela IV. of Hungary, and received special privileges and immunities to induce them to settle in the country, and improve the cultivation of the soil; and the Szeklers, or Szekhelyi, are believed to be the descendants of the once formidable Huns. The last three are the dominant races of Transylvania, and live apart from each other—the Magyars occupying the w. and centre, the Saxons the s. and n.e., and the Szeklers the s.east. The Magyars, Bulgarians, and Armenians speak the Magyar language as used in Hungary; the Saxons employ Low-German in speaking, and High-German in writing, but with a considerable mixture of Magyar in both; the Szeklers speak a Turanian dialect; and the Walachs use their own language intermixed with corrupt Latin. Transylvania is little noticed in history till the Christian era, when part of it was occupied by the warlike Dacians, soon after whom the Sarmatian tribes of the Jazyges and Carpi settled in it. The conquest of the Dacians by Trajan, however, did not include that of the other two peoples, who proved very troublesome to the Roman settlers along the Danube, till they were conquered by Diocletian. and the Carpi carried away to Pannonia and other districts. In the middle of the 4th c., the Goths overran the country, defeating the Sarmatians in a great battle on the Maros, in which the monarch and the chief of his nobility perished; and they in their turn were forced in 375 to retire before the Huns and their confederates. The Gepidæ next took possession of Transylvania till their almost complete extirpation, in 566, by the Lombards and Avars. It was conquered by the Hungarians about 1000, and was governed by Woivodes till 1526, when the death of the Hungarian monarch at Mohacs prepared the way for the union of the two countries under the Woivide, John Zapolya; but the war which thence arose with the Austrians caused their complete severance, and Zapolya's sway was, in 1535, confined to Transylvania, of which he became sovereign lord, under the protection of the Turks. Transylvania, on its conquest by the Hungarians, was only partially settled; the eastern part constituted a grazing-ground for wandering tribes who had migrated thither. The Saxons were summoned by the Hungarian monarchs to act as a counterpoise to the increasing power of the nobles; and from similar motives the Burzen land was given to the Teutonic knights, but the arrogant bearing of those soldiers of the cross soon offended their titular lord, and they were forced to leave the country. The "golden charter" of king Andrew II. (1224) secured a perfectly free political system to the Saxons, whose "comes" or chief was, like the head of a clan, both judge and leader, and from whom the only appeal was to the king in person. The firm protection and generous treatment accorded to the Saxons by the Hungarian monarchs were rewarded by steadfast loyalty, and succor in men and money whenever required. During the rest of the 16th c., the country was distracted by the bitter strife between the Catholic party, who were supported by Austria, and the Protestant party, who were allied with the Turks; the latter party, headed successively by princes of the houses of Zapolya and Bathory, generally maintaining the superiority. The next chief of the Protestant party was the celebrated Botskay, whose successes against Austria extorted from the emperor an acknowledgment of the independence of Transylvania in 1606. To him succeeded Bethlem Gabor, the determined foe of Catholicism and Austria, who did important service during the thirty years' war. Between his son and successor, Stephen, and Ragotski arose a contest for the crown, in which the latter prevailed; but on Ragotski's death, the civil war was resumed, till the complete rout of the Austrians by the Turks, under Kiupruli, placed the scepter in the hands of Michael Abaffi, who reigned, till his death in 1690, as a vassal of the Porte. The Austrians now again possessed themselves of Transylvania, despite the heroic resistance of Ragotski; and though Tekeli (q.v.) succeeded for a brief period in rolling back the invaders, the peace of Carlovitz, in 1699, again put them in possession; and after the death of Michael Abaffi II., in 1713, Transylvania was completely incorporated with Hungary. It was erected into a grand principality in 1765. During the insurrection in 1848 the Hungarians and Szeklers joined the insurgents, and forced Transylvania to reunite with Hungary, despite the opposition of the Saxons; and the Walachs, still little better than a horde of savages, were let loose over the land to burn, plunder, and murder indiscriminately; the prostration of the country being completed in the following year during the bloody conflicts which took place here between Bem and the Russian troops. In the same year Transylvania was again separated from its turbulent neighbor, and made a crownland; the portions of it which had, in 1835, been annexed to Hungary being

restored, as well as the Transylvanian military frontier in 1851. In 1867 Transylvania was again united with Hungary. It is now a province under the Hungarian crown, and is officially styled a grand-duchy. See *Transylvania, its Products and its People*, by C. Boner (Lond 1865).

TRANSYLVANIA, a co. in s.w. North Carolina; about 300 sq.m.; pop. '80, 5,340—517 colored. The surface is mountainous, and most of it timber land. Co. seat, Brevard.

TRAP or **TRAPPEAN ROCKS**, an important section of the igneous rocks (q.v.), associated with primary and secondary strata, so called from the Swedish *trappa*, a stair, because these rocks, having resisted, from their greater hardness, the abrading influences which have destroyed the softer sedimentary strata, stand out like huge steps on the faces of the hills and mountains in some places where they occur. Unlike granite, the trap rocks are free from silica crystallizing as a separate constituent of the rock; from the modern volcanic rocks the structural difference is very slight, consisting only of the manner in which the silicate of magnesia and lime, common to both, is crystallized—in the older rocks appearing as hornblende, while in the newer it exists as augite.

Trap rocks are composed of feldspar and hornblende, and the different varieties founded on the chemical composition of the mass depend on the relative proportion of these two minerals. When the feldspar predominates, the rock belongs to the feldspathic trap or feldstone series; and when the hornblende is abundant, it is a hornblende trap or greenstone. This latter series contains the best-known trappean rocks. The dark hornblende preponderates, and gives to the rock a dull green color, from which it derives its well-known name of greenstone, a translation of the German *grünstein*. It has, however, been shown by Delesse that many trappean rocks owe their color to a dark variety of feldspar which exists in them, and such rocks belong rather to the feldspathic than to the hornblende series. Some greenstones are very light green, others are so dark as to appear black, and all intermediate shades of color occur. These rocks vary also very greatly in texture: in some, the crystals are sufficiently large to be detected with the naked eye; while others are so fine-grained and compact that it is difficult to resolve the separate crystals even with the help of a lens. Experiments have shown that the size of the crystal in an igneous rock increases in proportion to the length of time during which the mass remains fluid, and so permits the continued crystalline segregation of its various ingredients. The vitreous trap and obsidian would accordingly represent a speedily cooled flow of liquid rock. In fine-grained basalt, the crystalline force has been slightly developed; while greenstones of different textures exhibit its more continued operations in proportion to the coarseness of their texture. The principal varieties of hornblende trap are greenstone, whinstone, or trap proper. When the crystals are extremely minute, and there is a tendency in the rock to become columnar, it is a basalt. If the feldspar is a soda-feldspar, either albite or oligoclase, it is diorite. Euphotide, diallage rock, or gabro, is a compound of Labrador feldspar and diallage, a variety of hornblende; it is a coarse, or sometimes fine-grained rock, with a granitic or porphyritic aspect. Hypersthene rock, or hyperite, is made up of Labrador feldspar and hypersthene, another variety of hornblende; it is also a granitic-looking rock, very tough, and of a grayish or greenish-black color: it is very abundant in the isle of Skye. Different varieties of hornblende trap are based upon the structure of the rock, as well as upon its chemical composition. Trappean obsidian is not a common rock, but it is occasionally found. Porphyritic trap is more abundant; a very black variety has received the name of metaphyre. Amygdaloid is a trap with round or almond-shaped cavities, filled with agate, calcite, or other minerals, scattered through it. Trap tuff consists of fragments of scoria, volcanic dust, and pieces of other rocks, forming a coarse irregular mass, sometimes bound together by a calcareous cement.

The characteristic rock of the feldspathic series is feldstone, compact feldspar, or petrosilex. It is a light-colored, greenish, or bluish, very compact, homogeneous, and translucent rock, with a flinty-looking appearance. It forms a large proportion of the contemporary intruded trap rocks in the silurian measures of Wales. Clinkstone, or phonolite, is a variety found in layers or slabs which give a metallic ring when struck with the hammer. Aphanite, or cornean, scarcely differs from true feldstone, except that it is a more compact and tougher rock. Pitchstone, or retinite, is a vitreous feldstone, less glassy than obsidian, and of a green color and resinous luster: a dyke 30 ft. wide occurs on the eastern shores of the island of Arran, cutting through the sandstone rocks. When distinct crystals of one or more minerals are scattered through an earthy or compact base of feldstone, a feldspathic porphyry is formed. The ancient red porphyry of Egypt, known as *rosso antico*, belongs to this set of rocks; it consists of a red feldspathic base, in which are disseminated rose-colored crystals of oligoclase, with some plates of blackish hornblende and grains of oxidized iron ore.

As true igneous rocks come up from below, there is always a connection of some kind between the ejected mass and the inferior source of supply, except when the ejected materials have been subsequently arranged by atmospheric or aqueous agency. Pipes and dykes form such connections, and they are generally associated with tabular masses which have either spread themselves over the surface, or inserted themselves between the beds of the sedimentary strata. When the materials have been mechanically arranged,

the igneous rocks are contemporaneous with the deposits in which they occur; but in all cases where strata are cut through by dykes or pipes, or are covered by flows of liquid rock, the igneous rocks are newer than the sedimentary strata with which they are associated.

TRAPA, a genus of plants, of the natural order *haloragiacæ* (q.v.), having a 4-parted calyx, a 4-petallous corolla, and a nut on which the altered calyx appears in the form of spines; the cotyledons very unequal in size. All the species are aquatic plants, with floating habit. *T. natans*, the **WATER CALTROPS**, is the only European species. It is found in ditches and ponds in the s. of Europe, and is grown in ponds in Holland. The floating leaves are rhomboidal, toothed and smooth; those under water are cut into capillary segments. The fruit has four spines; the kernels are large and almond-like. They are good to eat, either raw or roasted, and somewhat resemble chestnuts in taste. They are often used in soups. The French name is *marron d'eau* (water chestnut). *T. bispinosa*, the **SINGHARA NUT**, affords a great part of the food of the inhabitants of Cashmere, and a tax laid upon it by Runjeet Singh yielded a large sum annually. *T. bicornis* is much cultivated in China, where the cultivation of aquatic plants is carried on to a degree unknown in other parts of the world, and its fruit is much used for food. In both these species, the nut has only two spines.

TRAPANI (anc. *Drepānum*), one of the principal sea-ports of Sicily, on cape Trapani, in the n.w. of the island; capital of the province of that name, 40 m. w. of Palermo. Pop. '71, 26,914. The town is walled, and defended by a fortress. The streets are wide, and well paved with flag-stones. There is a natural harbor, capable of admitting vessels of about 300 tons; a handsome town-house; a tower built by the Saracens; a cathedral; and many churches, some of which contain fine paintings. The inhabitants are engaged in the tunny, anchovy, and coral fisheries. The coral is brought from the coast of Barbary to Trapani to be cut and polished for exportation. Trapani is a busy town, and exports sumac, salt, soda, coral, alabaster, wine, tunny, and anchovies.

Ancient *Drepānum* was probably founded by the Carthaginians, under whom it became an important stronghold. Here took place a celebrated naval engagement between the Romans, under P. Claudius, and the Carthaginians, under Adherbal, 249 B.C., in which the former were completely beaten. In Roman history the name scarcely appears, but it seems to have flourished in obscurity both then and during the middle ages.

TRAPEZIUM (Gr. *trapezion*, a little table) is the general term for a four-sided plane figure, and is synonymous with "quadrilateral." But since all four-sided figures which have parallel sides possess distinctive appellations, the term trapezium is frequently restricted to quadrilaterals whose sides are not parallel. The trapezium in the restricted sense (exclusive of parallelograms), has some remarkable properties; thus, if its sides be bisected, and the adjacent points of bisection joined, the resulting four-sided figure is a parallelogram; the sum of the squares of its diagonals is equal to the sum of the squares of the sides, together with four times the square of the line joining the middle points of the diagonals; if it can be inscribed in a circle (i.e., if its four corners are in the circumference of any circle), the one pair of opposite angles is equal to the other pair, and the sum of the rectangles by each pair of opposite sides is equal to the rectangle by the diagonals; if it can be described about a circle (i.e., if a circle can be made to touch on the interior, each of the four sides), the one pair of opposite sides is equal to the other pair.

TRAPEZOID, a plane quadrilateral which has two of its sides parallel, and the other two not.

TRAPPIST ORDER, THE, celebrated among the religious orders of the Roman Catholic church for its extraordinary austerities, is so called from La Trappe, an abbey of the Cistercian order founded in the middle of the 12th century. The discipline of this monastery, in common with many others of the more wealthy monastic bodies, especially of those which, by one of the corruptions of the period, were held *in commendam*, had become very much relaxed; and in the 17th c. but little trace of the ancient religious observance remained. In the first half of that century the abbey of La Trappe fell, with other ecclesiastical preferments, to the celebrated Armand Jean le Bouthelier de Rancé. The circumstances which led this remarkable man to undertake a reform of his monastery, and in the end the establishment of what was equivalent to a new religious order, have been already detailed in the article Rancé (q.v.). It was in the year 1662 that he entered in earnest upon his duties, and commenced his reforms. At first he encountered decided, and even violent opposition from the brethren; but his firmness and vigor overcame it all. He himself, as an evidence of a complete change of life, entered upon a fresh novitiate in the year 1663; and in the following year made anew the solemn profession, and was reinstalled as abbot. From this time may be dated the introduction of the new austerities which have characterized the order. The monks were forbidden the use of meat, fish, wine, and eggs. All intercourse with externs was cut off, and the old monastic habit of manual labor was revived. The reform of De Rancé is founded on the principle of perpetual prayer and entire self-abnegation. By the Trappist rule, the monks are obliged to rise at two o'clock A.M. for matins in the church,

which lasts till half-past three; and, after an interval occupied in private devotion, they go at half-past five to the office of prime, which is followed by a lecture. At seven they engage in their several daily tasks, indoors or out, according to the weather. At half after nine they return to the choir, for the successive offices of terce, sext, and none; at the close of which they dine on vegetables dressed without butter or oil, and a little fruit. This meal is succeeded by manual labor for two hours, after which each monk occupies an hour in private prayer or reading in his own cell until four o'clock, when they again assemble in the choir for vespers. The supper consists of bread and water, and, after a short interval of repose, is followed by a lecture. At six o'clock they recite complin in choir, and at the end spend half an hour in meditation, retiring to rest at eight o'clock. The bed is a hard straw mattress, with a coarse coverlet; and the Trappist never lays aside his habit, even in case of sickness, unless it should prove extreme. Perpetual silence is prescribed, unless in cases of necessity. The minor practices and observances are devised so as to remind the monk at every turn of the shortness of life and the rigor of judgment; and the last scene of life is made signal in its austerity by the dying man being laid during his death-agony upon a few handfuls of straw, that he may, as it were, lay aside upon the very brink of the grave even the last fragment of earthly comfort to which the necessities of nature had till then compelled him to cling.

The reformed order of La Trappe scarcely extended beyond France in the first period of its institution. The inmates of La Trappe shared, at the revolution, the common fate of all the religious houses of France; they were compelled to quit their monastery; but a considerable number of them found a shelter at Valsainte, in the canton of Freiburg in Switzerland. In the vicissitudes of the revolutionary war, they were driven from this house; and a community numbering about 250, together with a large number of nuns, who had been established for purposes of education, found refuge at Constance, at Augsburg, at Munich, and eventually, under the czar Paul, in Lithuania and White Russia. Later in the course of the war, small communities obtained a certain footing in Italy, Spain, America, England, and, notwithstanding the prohibitory law, even in France, at Mont Genevre. After the restoration they resumed, by purchase, possession of their old home at La Trappe, which continues up to the present time to be the head monastery of the order, and numbers nearly 200 members. During the course of the last 50 years they have formed many establishments in France; a few in Germany; a very considerable one at mount Melleray, near Cappelouin, in the county of Waterford, Ireland; and others, with still more extensive territory annexed, in Kentucky, Illinois, and other states of North America. A modification of the Trappist order, called "Trappist preachers," was established about 30 years since, at Pierre-qui-Bire, near Avallon.—See Gaillardin's *Trappistes; ou l'Ordre de Cîteaux au 19^e Siècle* (Paris, 1844).

TRASH. See SUGAR.

TRASIMENUS LACUS, the ancient name of an Italian lake (*lago Trasimeno*, or *lago di Perugia*) lying between the towns of Cortona and Perugia. It is about 10 m. in length by 8 in breadth; the greatest depth is not above 30 ft. The lake has no apparent outlet, and the margins are flat and overgrown with reeds. It is surrounded on all sides by hills, those on the north side, extending from Cortona to the lake, being known as the Gualandro hills—the *montes Cortonenses* of Livy—covered at the present day with oak, vine, and olive plantations. The lake contains three islands. Trasimenus Lacus is memorable chiefly for the great victory obtained by Hannibal in 217 B.C. during the second Punic war, over the Romans, under their consul, C. Flaminius. Hannibal, leaving Fæsulæ, passed close by the camp of Flaminius at Arretium, laying waste the country as he proceeded in the direction of Rome. This, as the Carthaginian general intended, induced the consul to break up his encampment, and follow in pursuit, Hannibal in the meantime taking up a strong position on the hills on the n. side of the lake, along which he was passing. The consul coming up early next morning, when the whole place was enveloped in mist, saw only the troops in front on the hill of *Tuoro*, with whom he was preparing to engage, when he found himself surrounded and attacked on all sides. The Carthaginians thus had the Romans completely in their power, and took such advantage of the opportunity that 16,000 Roman troops are said to have been either massacred or drowned in the lake, Flaminius himself being among the first who fell; 6,000 troops who had forced their way through the enemy, surrendered next day to Maharbal. It is said both by Livy and Pliny that the fury on both sides was so great as to render the combatants unconscious of the shock of an earthquake which occurred during the battle.

TRAS-OS-MONTES (beyond the mountains), a province of Portugal, forming the n.e. corner of the country, is bounded on the n. and e. by Spain, on the s. by the river Douro, and on the w. by the Portuguese province of Minho. Area, 4,275 sq.m.; pop. 74,416,761. It is in the main a cold plateau, with bare mountain masses, broken through by deep romantic ravines; but the port-wine district, known as the *Alto-Douro*, is very pleasant. Considerable quantities of wheat and rye are raised, but the chief products are wine and oil. In several places, the silk-worm cultivation is prosecuted with success. Fruits, especially oranges, are produced abundantly in the valleys, and sumach on the mountains, which are also rich in unutilized metallic wealth.

TRASS, a tufaceous deposit of the extinct volcanoes of the Eifel, near Coblenz, resembling the Puzzolana of Naples. Its base consists almost entirely of pumice, in which are imbedded fragments of basalt, burnt shale, slate, sandstone, etc., and even numerous trunks and branches of trees. Its formation is accounted for by supposing an eruption to have taken place, with copious evolution of gases, in a lake-basin, and a flood of the mud thus formed to have swept away whatever came before it. Large areas are covered by the trass, which has choked up valleys, now partially re-excavated.

TRAVANCORE, a protected state in the extreme s. of India, bounded on the e. by the states of Tinneveli and Madura, and on the w. by the Indian ocean. Area, 6,730 sq. m.; pop. '71, 2,311,379. At the southern extremity of the state is cape Comorin (properly Kumarin). On the elevations the soil is light and gravelly; in the valleys it is in general a deep black mold. Rice, the sago-palm, and vegetables, are the principal products. Formerly the capital was Travancore, a decayed and unimportant town; the present capital is the small town Trivanderam.

TRAVELERS, LAW AS TO. In the United Kingdom, entire freedom of traveling is one of the rights of the subject. The rights of travelers in regard to the use of roads are stated under the head of highway (q.v.). Other rights are noticed in connection with inn (q.v.). With regard to travelers by conveyances, whether by land or sea, if the party conveying is a public carrier, then the following are his liabilities: A public carrier having a stage-coach (and railway companies are on the same footing) does not engage or warrant to convey a traveler with absolute safety, as is the case with respect to goods, but merely to convey without negligence on his part; hence, if the conveyance meets with some accident, resulting in injury to the traveler, the right of the latter to recover damages depends on whether the carrier or railway company has been guilty of negligence. Considering that, in case of a dispute, it is always left to a jury to say whether there was negligence or not, it is a safe maxim, that there is scarcely anything in the form of an accident which is not resolvable by a jury into negligence on the part of the carrier or company; and an injured traveler has seldom much difficulty in throwing the burden on the carrier of proving that there was no negligence on his part; and this proof, for the reasons stated, is seldom successful, at least where the accident arose from a defect in guiding the carriage. In case of accidents not fatal, the party injured has almost always a remedy against the carrier, the chief dispute being as to the amount of damages, the amount legally demandable varying according to the position in life and injury to business caused by the accident. In case of death caused by blamable accident in traveling, there was formerly no remedy available to the executors or relatives, and there is none at the present day; but if the deceased party leave a wife, husband, parent, or child, then these, but no other relations, can sue for damages. In the case of a traveler's proceeding a great distance over several lines of railway, his remedy is entirely against the company with whom he contracted—that is to say, to whom he paid the lump sum, and from whom he obtained his ticket. A carrier may contract not merely to carry a traveler a certain distance by his own conveyance, but to carry him to any part of the world, using for that purpose various other intermediate railways or steamers for the rest of the journey; and in all such cases the only person with whom the traveler contracts is the carrier to whom he paid his fare, who is liable for any accident or negligence, whether occurring on his own part of the line, or on any other part.—As to traveler's luggage, see LUGGAGE.

TRAVELER'S TREE, or RAVENALA, *Urania speciosa*, or *Ravenala Madagascariensis*, a remarkable plant of the natural order *musaceæ*, a native of Madagascar, and forming a characteristic feature of the scenery of many parts of that island. The stem resembles that of the plantain, but sends out leaves only on two opposite sides, like a great expanded fan. The lower leaves drop off as the stem grows, and in an old tree the lowest leaves are sometimes 30 ft. from the ground. A tree often has 20 or 24 leaves, the stalk of each leaf being 6 or 8 ft. long, and the blade 4 or 6 ft. more. The blade of the leaf is oblong, bright green, and shining. The fruit is not succulent, but is filled with a fine silky fiber of the most brilliant blue or purple color, among which are about 30 or 40 seeds. Forty or fifty fruits grow in a bunch, and three or four bunches may be seen at once on the tree. The leaves are much used for thatch, and for many other purposes; and the leaf-stalks for the partitions, and often even for the walls of houses. The leaf-stalks always contain water, even in the driest weather, more than a quart being readily obtained by piercing the thick part of the base of a leaf-stalk, and this water is pure and pleasant; hence the name *traveler's tree*.

TRA'VEMÜNDE. See LÜBECK.

TRAVERSE, in fortification, mounds of earth, above the height of a man, and 18 ft. thick, placed at frequent intervals on a rampart to stop shot which may enfilade the face of such rampart. A fire of this nature, in the absence of traverses, would dismount the guns, and prove altogether ruinous. The traverses also give means of disputing the progress of an assailant who has gained a footing on the wall, for each traverse becomes a defensible parapet, only to be taken by storm.

TRAVERSE, in the law of England, means the denial of fact given by one party in an action to the pleading of his adversary.

TRAVERSE, a co. in w. Minnesota, adjoining Dakota; bounded w. by lake Traverse; drained by the Mustiaka and Bois de Sioux rivers; 570 sq.m.; pop. '80, 1503—953 of American birth. The surface is prairie, with very little timber.

TRAVERSING PLATFORM, an arrangement for the more rapid and easy movement of cannon in battery. The gun is either mounted on an ordinary truck-carriage, or on rollers under its trunnions. The truck or rollers work in and out on two parallel iron rails, which rails are mounted on the traversing carriage, and are 16 ft. or more in length. Wheels at each end of this platform, or more frequently if the weight of the gun be very great, are placed at right angles to the direction of the rails, and run on circular tramways, which have their center in the embrasure through which the gun is fired. The rails incline upward toward the rear, to moderate the gun's recoil. The advantages are, that the leverage for turning the gun is increased by the platform's length, while the circular rails diminish the resistance; that the gun is easily run out for firing on the upper rails; that by its own recoil it runs itself in again for loading; and that a much smaller embrasure is required to give a good compass to the muzzle.

TRAVERTINE, the Italian name for limestone formed by springs holding lime in solution.

TRAVESTY (Fr. *travestir*, to disguise, particularly through the effect of *contrast*; e.g., to dress in another sex's or person's clothes; Ital. *travestire*) is a term applied in literature to denote a burlesque representation of something previously executed in a serious and lofty manner. It differs from parody (q.v.) in this respect: That while the latter changes the subject-matter and the *dramatis personæ*, but mockingly imitates the style of the original, the former leaves the subject-matter partially, and the *dramatis personæ* wholly, unaltered; producing a purely comic effect by the substitution of the mean, the frivolous, and the grotesque in action or speech, for the serious, the noble, or the heroic.

TRAVIS, a co. in central Texas, drained by Colorado river and Union creek; traversed by the International and Great Northern, and the w. branch of the Houston and Texas Central railroads; about 1000 sq.m.; pop. '80, 26,974—24,007 of American birth, 8,623 colored. The surface is undulating, and the soil fertile; cotton, corn, sweet potatoes, and pork are staples. Co. seat, Austin, also the capital of the state.

TRAVNIK, a t. of Bosnia (now under Austrian administration), and recently its capital, stands on the Lasva river, 45 m. w.n.w. of Bosna-Serai. Its numerous mosques and the castle, which dates from the middle ages, are the principal edifices. It contains 12,000 inhabitants, almost all Mohammedans. The principal branch of industry is the manufacture of sword-blades.

TRAWLING, a mode of fishing by a net dragged along the bottom of the sea, behind a boat. It is much employed in deep-sea fishing on the coast of England, and by far the greater part of the fresh fish brought to the London market, herring and mackerel excepted, is now obtained by trawling. Trawling has long been practiced on some parts of the s. coast of England, but of late years this mode of fishing has been adopted much more extensively than before, and has been introduced where it was formerly unknown, particularly on the e. coast of England, not without great opposition on the part of line-fishers and others, who have loudly complained of injury done by it to the fisheries by destruction of spawn, and otherwise. The report of the commissioners on the sea-fisheries of the United Kingdom, 1866, sets aside all complaints against it, however, as unfounded; while its great productiveness recommends it as advantageous to the public interest. The *trawl*, or *beam-trawl*, as it is often called, is a triangular purse-shaped net, about 70 ft. long, usually having a breadth of about 40 ft. at the mouth, and gradually diminishing to 4 or 5 ft. at the commencement of the *cod*, or smaller end of the net, which is about 10 ft. long, and of nearly uniform breadth. The upper part of the mouth is secured to a wooden beam about 40 ft. long, which keeps the net open; this beam is supported on two upright iron frames, known as the *trawl-heads* or *irons*. The under side of the net corresponds with the upper, except that instead of being fastened to a beam, it is made with a deeply-curved margin attached to the *ground-rope*, the whole length of it in contact with the ground. A trawl has also generally two *pockets*, one on each side, made by lacing together the upper and under parts, so that fish turning back from the cod may be caught in them. The meshes vary in size from 4 in. square at the mouth to an inch and a quarter square in the cod. Two stout ropes, of about 15 fathoms each, are fastened, one to the front of each of the trawl-heads, the other ends united to form a bridle, to which is shackled a warp 150 fathoms long. By this warp the trawl is towed, the quantity of rope paid out depending on depth of water, weather, and other conditions. Trawling is generally in the direction of the tide, sometimes across it, but never against it. The rate of progress is usually only from $\frac{1}{4}$ a m. to 2 m. an hour faster than that of the stream. The trawl can only be used with advantage on a sandy bottom or other smooth ground. On rough ground the net would be torn in pieces. The vessels employed in trawling on the Dogger bank and elsewhere near the English coast vary in size from 35 to 60 tons. Many of these trawlers, however, stay out

at sea for six weeks at a time in all seasons of the year; their fish being packed in ice collected by fast-sailing cutters, and so conveyed to market. Cod, haddock, and other *white-fish* are caught in great numbers by trawling; and some kinds of flat-fish, as soles, are scarcely to be obtained by any other means. Smaller trawl-nets than those above described are used in bays and estuaries. A kind of trawl called the *pole-trawl* was formerly in use in some parts of England, but is now used only in the s. of Ireland. It is much less effective than the beam-trawl. Instead of a beam, two poles of 25 to 30 ft. long are used, rigged out on the sides of the vessel, to keep the mouth of the net open.

The term trawling is commonly, although incorrectly, employed in Scotland to designate a particular mode of herring-fishing, which, however, is only seine-net fishing (see NETS) on the principle of encircling shoals of fish, as has been practiced in pilehard-fishing on the s. coast of England from time immemorial. It is of recent introduction in Scotland, and has been opposed by the drift-net herring fishers, from interested motives, in the same way that beam-trawling has been opposed on many parts of the English coast. The legislature too hastily accepted the views of its opponents; but a royal commission having been appointed to inquire into the subject, made a report decidedly favorable to it in 1863; and the judgment of that commission was sustained by the report of the sea-fisheries commission of the United Kingdom in 1866.

TREACLE. See SUGAR.

TREAD-MILL, an appliance of prison discipline, much in use some years ago in the prisons of Great Britain, the invention of sir William Cubit, of Ipswich. It consists of a wheel in the form of a long cylinder, furnished with 24 steps round its circumference, and turned on its axis by the tread of prisoners, each of whom may be made to tread in a separate compartment, so boarded off that he can have no intercourse with the rest. The prisoners are assisted and supported by a hand-rail, and cause the wheel to revolve about twice in the minute. The tread-mill has sometimes been made productive by being used to grind corn or turn machinery. It has been found an objection to its use, that it does not admit of being modified to meet the varying strength of individual prisoners; and as an instrument of prison discipline, it has been generally supplanted by the *crank*, a small flaked wheel, like the paddle-wheel of a steamer, which, on the prisoner turning a handle outside, revolves within a box partially filled with gravel. The amount of strength necessary to each revolution can be regulated by the quantity of gravel used, and a register placed outside the prisoner's cell records the number of revolutions made. The crank is only used when hard-labor is part of the prisoner's sentence.

TREADWELL, DANIEL, 1791-1872; b. Mass.; invented a new form of the printing press in 1818. During a visit to England in 1819 he originated a power-press, and in 1826 he proposed the turnout system for single-track railroads. He invented in 1829 the first successful machine to spin hemp for cordage, and works for that purpose were put up in Boston in 1831. He invented what substantially is now known as the Armstrong gun at least eighteen years before sir William Armstrong, who added to the Treadwell gun rifling and breech-loading. Treadwell, with Dr. John Ware, founded in 1822 the *Boston Journal of Philosophy and the Arts*. He was Rumford professor of technology at Harvard college, 1834-45.

TREADWELL, JOHN GOODHUE, 1805-56; b. Salem, Mass.; son of Dr. John Dexter, graduated from Harvard university, 1825; studied medicine, established a practice in Salem, 1830; and devoted much time to farming by scientific methods, and making agricultural experiments. He founded a professorship of physiology and anatomy at Harvard university, bequeathing to it an estate valued from \$75,000 to \$100,000; and to the Essex county agricultural society he left his Topsfield farm for experimental purposes.

TREASON (Fr. *trahison*, Lat. *traditio*, from *tradere*, to give up or betray), in the law of the United Kingdom, is the highest civil crime which a member of the community can commit, being treachery against the sovereign. By the ancient common law of England, there was great latitude as to what was held by the judges to be treason, whereby, says Blackstone (b. iv. c. vi.), the creatures of tyrannical princes had opportunity to create abundance of constructive treasons, that is, to raise, by forced and arbitrary constructions, offenses into the crime and punishment of treason, which never were suspected to be such. Thus, the accosting, or attempting to exercise royal power—a very uncertain charge—has been treated as treason; and killing the king's father or brother, or even his messenger, has also been so treated. The inconvenience of these constructive treasons led to the passing of the statute of 25 Ed. III. c. 2, which attempted to define treason, and it was defined in five forms: 1. When a man compasses or imagines the death of the king, queen, or their eldest son and heir. Under this clause it was held that the husband of a queen-regnant was not included; but it includes a king *de facto* without regard to his title. The phrase "compassing and imagining the death of a king," has given rise to much discussion, but it has been taken to mean the mere purpose or design, as distinguished from the carrying such design into effect; nevertheless, the purpose can only be proved by some overt act, such as providing weapons or ammunition for the purpose of killing the king, assembling and consulting on the means to kill the king, etc. The law has often, however, been strained, and in arbitrary reigns

even a sermon unpreached was held to convict Peachum; and a paper found in a closet, to convict Algernon Sidney, though merely speculative in its character. 2. Another form of treason is the violating of the king's companion (i.e., wife), or his eldest daughter unmarried, or the wife of the king's eldest son and heir. 3. Another form is that of levying war against the king in his realm, either by taking arms to dethrone the king, or under pretense to reform religion or the laws; by resisting the king's forces; by joining an insurrection, with an avowed design to pull down all inclosures, all brothels, and the like; though such a conspiracy, if aimed at a particular house, would be only a riot. 4. It is also treason to adhere to the king's enemies in the realm by giving them aid and comfort, as by sending intelligence or provisions, or selling arms. 5. Lastly, it is treason to slay the chancellor, treasurer, or the king's justices of the bench, or in assize, while in their places administering justice. Besides these specific forms of treason, the statute of Edward III. enacted that, if there should be other cases not above specified, the judge should tarry without going to judgment, till the king and parliament should judge it treason or other felony—which was a safeguard against the judges indulging too much in refinements about constructive treason. At a later period, between the reigns of Henry IV. and queen Mary, the courts returned to the system of inventing constructive treasons, and actually included as such the clipping of money, burning houses to extort money, refusing to abjure the pope, etc. These and other new-fangled treasons were totally abolished by a statute of 1 Ed. VI. c. 12. By a subsequent statute of 1 Anne c. 17, whoever endeavors to hinder the next in the succession under the act of settlement, from succeeding to the crown, is to be held guilty of treason; and whoever maliciously affirms another to have right to the crown, otherwise than according to the act of settlement, commits treason. Moreover, by 36 Geo. III. c. 7, whoever compasses or intends death or bodily harm to the person of the king, is to be adjudged a traitor. One of the characteristics of an indictment for treason is, that a copy of the indictment, and a list of the witnesses and jurors, must be delivered to the prisoner. This information, which gives the names, and also the places of abode of all the witnesses, must be delivered to the prisoner ten days before the trial; and the prisoner is entitled to have counsel assigned to defend him. This right, which prisoners accused of other crimes have not in English law, was conferred by a statute of Will. III.

The punishment of treason was severe and even revolting. The traitor was to be drawn on a hurdle to the place of execution, hanged by the neck, his head then severed from the body, the body divided into four quarters; and the head and quarters to be at the disposal of the crown. But in 1870 these barbarities were repealed, and the sentence is now changed into hanging. The consequence of a conviction of treason was forfeiture and corruption of blood; the corruption of blood having the effect that the attainted person could neither inherit lands from his ancestor, nor transmit them to any heir. But this was altered as regards England and Ireland in 1870 by the statute 33 and 34 Vict. c. 23. The convict forfeits and is disqualified for any public office; the court may order him to pay the costs of his conviction, and his whole property is transferred to administrators named by the crown, who administer it and retransfer the surplus to his heirs and representatives.

There are certain minor offenses which are called misprision of treason, being those closely bordering on treason. Such are offenses which consist in the bare knowledge and concealment of treason, without any degree of assent thereto, for any assent makes the party a principal traitor. If a person, knowing of the treason, do not forthwith reveal it to some judge of assize or justice of the peace, this is the crime of misprision of treason. The punishment of misprision of treason was loss of goods and lands during life. Another offense closely related to treason is the willfully pointing a gun at, or attempting to strike, the person of the sovereign, with intent to injure him (or her); the offense being recently reduced, by statute 5 and 6 Vict. c. 51, to one punishable with three years' imprisonment. There is also a cognate offense created by 11 and 12 Vict. c. 12—that of intending to depose the queen, or levying war against her in order to intimidate her or the houses of parliament. The offense of *præmunire* (q.v.) was originally the introducing a foreign power into the country, and the name was extended to similar offenses. The law of treason in England and Scotland is nearly the same.

TREASON (*ante*), in the United States, may be either against an individual state or against the United States. In the former case it is an offense at common law. By the constitution (art. 3, sec. 3) treason against the United States consists in levying war against them, or in adhering to, or giving aid and comfort to, their enemies. It is further provided that no person shall be convicted of treason unless on the testimony of two witnesses to the overt act or upon confession in open court. The penalty is death. A conspiracy to commit treason does not constitute the crime, unless followed by overt acts. In the meaning of the term "enemies" of the United States, pirates or robbers actually invading our territory are included.

TREASURER, **LORD HIGH**, the name given to the third great officer of the crown in England, who, in former times, was sole head of the king's exchequer. In the reign of William I. a separate board and court for matters of revenue was appointed after the model of the exchequer of Normandy, and a treasurer and other officers were appointed for transacting business relating to the royal revenue. Odo, earl of Kent, was the

earliest holder of this office; but the early treasurers were for the most part churchmen. The functions of the treasurer were often discharged by the chief justiciary, and the offices of justiciary and treasurer seem not to have been completely separated till the reign of Stephen. The office of lord high treasurer was for the first time put into commission by James I. in 1612; and from the accession of George I. down to the present time, it has been the practice to vest the office in a board of lords commissioners of the treasury. See **TREASURY**. In Scotland, a similar office existed prior to the union; and there were also lords high treasurers appointed in Ireland. On the union of 1707, the lord high treasurer of England became the lord high treasurer of Great Britain; and in 1816, by statute 56 Geo. III. c. 98, on the consolidation of the same offices in England and Ireland, he was constituted the lord high treasurer of the United Kingdom.

* **TREASURER OF THE HOUSEHOLD**, an officer in the lord steward's department of the royal household of the United Kingdom, who bears a white staff, and ranks next to the lord steward, for whom he is empowered to act in his absence. He is always a member of the privy council; and his tenure of office is dependent on that of the ministry. In former days, this office was hereditary, but it has long ceased to be so.

TREASURE-TROVE is the finding of hidden treasure in the earth, the word treasure meaning coin, gold or silver plate, or bullion. By the law of England, he who finds such things hidden in the earth is not entitled to them, but they belong to the crown. This is an exception to the general rule, that he who first finds a thing, whose owner is unknown, is entitled to keep it; and accordingly the exception is construed strictly, so that if the coin, etc., is not hidden in and covered by the earth, the finder, and not the crown, is entitled to it. If it is treasure-trove in the strict sense above described, then it is the duty of the finder to give notice to the crown; and to conceal it or appropriate it is an indictable offense, punishable by fine and imprisonment.—In Scotland, the rule is the same, and the finder is bound to inform the sheriff of the finding. It is not so generally known as it ought to be that the crown is in the practice of paying to the finder the value of the property, on its being delivered up; from misapprehension of this matter it is believed that many curious relics are lost by their finders consigning them to the melting-pot.

TREASURY, that department of the executive of the government of the United Kingdom which has the control of the revenue and expenditure of the country. The head of the treasury was in former times an officer called the lord high treasurer (see **TREASURER**, **LORD HIGH**), but his office has ever since the accession of George I. been executed by lords commissioners, who have become his permanent representatives. The treasury board now consists of the prime minister (generally styled first lord of the treasury), the chancellor of the exchequer, and three junior lords of the treasury, who have usually seats in parliament, as have also the two joint-secretaries of the treasury. The first lord being the head of the administration, his duties are not limited to the treasury, which is chiefly conducted by the other members of the board. The chancellor of the exchequer, who holds under a distinct patent the office of under-treasurer, is the effective head of the treasury, exercising the most responsible control over the expenditure of the different branches of the service, as also over all works demanding unusual outlay in the naval, military, and civil departments, either at home or in the colonies. He prepares an annual estimate of the expenses of the country, and of the ways and means by which they are proposed to be met; and this statement, known as the budget, is submitted by him to the house of commons. The prime minister, when a member of the house of commons, has occasionally held at the same time the office of chancellor of the exchequer. The duties of the junior lords are in a great measure formal: the heaviest portion of the executive functions of the treasury devolves on the secretaries.

The function of payment has ever since the restoration been completely separated from the custody of the public revenue, the former only being vested in the treasury, while the latter belongs to the exchequer. By an arrangement effected by 4 and 5 Will. IV. c. 15, the revenue flowing into the treasury is paid into the bank of England, to the credit of the comptroller-general of the exchequer, and all payments on the public accounts are made pursuant to a warrant or order of the treasury. No moneys voted by parliament can be drawn from the exchequer without the warrant of the treasury board, nor can any payment be made from the civil list without its authority.

The duties of the treasury board are numerous. The supplies for the army, navy, and civil service are issued under its authority. In virtue of various statutes, it has the regulation of the salaries of newly created officers in other departments, and of the number of officers in the establishments for new branches of the public service. The duties of the treasury also comprise the examination of the expenses of legal establishments, sheriffs, county courts, and criminal prosecutions. All payments for civil salaries, allowances, and incidental charges payable in England, and all payments for the army, navy, and ordnance, are made upon the special authority of the treasury by the paymaster-general. The boards of customs and inland revenue, and the post-office, are subject to its general authority. The office of woods and forests now discharges many of the duties which formerly devolved on the treasury, but is subject to its regulations. The establishments of colonial and other offices are also subject to the control of the treasury with regard to their expenses. The treasury may be appealed to

against the decisions of subordinate departments in all cases connected with the receipt of revenue. The treasury possesses the patronage of the departments immediately subordinate to it. The church patronage of the crown—except that which belongs to the lord chancellor—is usually disposed of on the advice of the first lord of the treasury; and the foreign and colonial secretaries, in all important appointments falling under their patronage, are in the practice of consulting the first lord of the treasury.

TREASURY OF THE UNITED STATES, the department of the executive government in which is vested the management of the national revenues. Its principal officer is the secretary of the treasury, whose position, though commonly supposed to be inferior to that of the secretary of state is really more important and responsible, except in certain rare emergencies. Besides the secretary there are 2 assistant secretaries, a treasurer, a registrar, a solicitor, 3 comptrollers, 6 auditors, commissioners of internal revenue and of customs, and some 16,000 employees, of whom about 3,000 are at Washington, and the rest in the internal revenue department or the sub-treasuries and custom-houses. Among the most important of the 18 bureaux into which the treasury department is divided are the coast survey, the bureau of statistics, and the mint.

TREAT, ROBERT, 1622-1717; b. England; emigrated to this country with Saltonstall, and became a judge in Milford, Conn. In 1673, when Springfield was attacked by Indians, he headed a relieving party and defeated the enemy at Hadley, and took part in the battle at Narragansett fort. He was lieutenant-governor, 1676, and governor, 1686-1701.

TREATY, in public law, an agreement of friendship, alliance, commerce, or navigation, entered into between two or more independent states. Treaties have been divided by publicists into *personal* and *real*, the difference being that the former relate exclusively to the persons of the contracting parties—for example, treaties guaranteeing the throne to a particular sovereign and his family—and the latter are treaties for national objects, independent of the rulers of the state. While personal treaties expire with the death of the sovereign, or the extinction of his family, real treaties bind the contracting parties independently of any change in the sovereignty of the states. The constitution of each particular state must be looked to, to determine in whom the power of negotiating and contracting treaties with foreign powers resides. In monarchies, whether absolute or constitutional, it is usually vested in the sovereign. By the constitution of Great Britain, the exercise of this power is subject to parliamentary censure; ministers who advise the conclusion of any treaty which shall afterward be judged derogatory to the honor, or disadvantageous to the welfare of the nation, being liable to impeachment, a proceeding of which English history affords numerous instances; as the impeachment of De la Pole, earl of Suffolk, in 1451, for making a convention of peace without the assent of the privy council; of Wolsey, in 1529, by the house of lords, for making treaties without the king's knowledge; and of the earl of Orford by the commons, in 1701, for advising treaties for dividing the dominions of Spain. In republics, the chief magistrate, senate, or executive council is intrusted with the exercise of this sovereign power. The constitution of the United States of America (art. ii. sec. 2) vests it in the president, with the advice and consent of the senate. No special form of words is necessary for the validity of a treaty; but modern usage requires that an agreement which has originally been verbal, should as soon as possible be committed to writing. There are certain compacts between nations which are included in the exercise of a general implied power confided to certain public agents as incidental to their official position. Such are the acts of generals or admirals limiting hostilities by truces, capitulations, or cartels for the exchange of prisoners, which do not require the ratification of the supreme authority, unless there be a reservation making that necessary. In other cases, however, a public minister or other diplomatic agent is not entitled to conclude or sign a treaty with the foreign power to which he is accredited, without a full power independent of his general letter of credence. Even in the case of a treaty concluded with full powers, it is often considered expedient to have a special ratification by the sovereign, or other proper authority of the state contracting.

A treaty is considered to be extinguished when one of the contracting powers loses its existence as an independent state, when the internal constitution of either state is changed so as to make it inapplicable; and in case of war between the contracting parties, unless the stipulations of the treaty have been expressly with a view to the rupture. As there is often a difficulty in distinguishing stipulations perpetual in their nature from those that are extinguished by war, it is common to insert clauses in treaties of peace reviving and confirming the treaties formerly subsisting between the contracting parties.

A *Treaty of guaranty* is an engagement by which one state promises to aid another when it is disturbed, or threatened to be disturbed, in the peaceable enjoyment of its rights by a third power.

Treaties of alliance may be offensive or defensive: in the former, the ally engages generally to co-operate in hostilities against a specified power, or against any power with which the other may be at war; in the latter, the engagements of the ally extend only to a war of aggression commenced against the other contracting party.


The execution of a treaty is occasionally secured by hostages; as at the peace of

Aix-la-Chapelle, in 1748, when several peers were sent to Paris as hostages for the restoration of cape Breton by Great Britain to France.

TREBBIA, a small but famous stream of Italy, rises in the Ligurian Apennines, near Monteburno, flows northward through a mountain valley for the greater part of its course, and joins the Po, two m. w. of Piacenza. Its entire length is about 50 miles. Here Hannibal decisively defeated the Roman consul Sempronius, 218 B.C.

TREBIGNE, a t., formerly in the Turkish eyalet of Bosnia, now belonging to Herzegovina; 52 m. n.e. of Mostow. It is a walled town, said to have 10,000 inhabitants.

TREBIZOND, or **TREBISOND** (in Turkish, *Tarabezûn*), is a Turkish eyalet in the n.e. of Asia Minor, stretching along the s.e. shore of the Black sea for 240 m., with an estimated pop. of 540,000. The surface is mostly mountainous, the slopes toward the sea being thickly wooded. The eastern portion of the eyalet is known as Lazistan, from its inhabitants, the Lazi, a savage vindictive race, distinguished among their neighbors for their barbarous manners and predatory habits. The port of Batoum and a part of Lazistan, on the Russian frontier, were ceded to Russia in 1878. Next to Trebizond, the most important places in Trebizond are Samsoun, Kerasun, and Gumish-Khaneh. The chief town of the eyalet is **TREBIZOND**, a flourishing sea-port city, on the Black Sea coast, about 110 m. n.w. of Erzerum. It is surrounded by walls of great extent, which inclose numerous gardens as well as the town itself, and is inhabited by a pop. of 40,000 to 50,000, chiefly Moslems. Outside the walls are various suburbs, where most of the Christian inhabitants reside, and in which the principal bazaars and khans have been established. The city is defended by several forts along the walls, and by a fortified citadel perched upon a high rock on one side of the town. It possesses an excellent harbor, which, however, is only considered safe during the summer months, the roadstead of Platena, 7 m. to the west, being employed for the rest of the year. There are numerous mosques and "medresses," ten churches for Greek Christians, copper foundries, dye-works, etc. The geographical position of Trebizond is, in a commercial point of view, rivaled only by that of Alexandria, and has made it the great entrepôt of the commerce between eastern Europe and central Asia, and the second commercial city of the Turkish empire. European goods are brought hither, since 1836, by regular services of steamers from Constantinople, and the mouths of the Danube; and those of Asia by caravans from Erzerum, Tabriz, and Syria. The value of the annual imports by sea is about £1,500,000; that of the annual exports may amount to a little over £1,000,000. The inland traffic with Anatolia is supposed also to represent a value of near £1,000,000. The goods brought overland embrace silk, wool, tobacco, wax, gall-nuts, oil, opium, drugs of various kinds, honey, timber, carpets, and shawls; and those arriving by sea are principally cotton cloths, glass, cutlery, fire-arms, as well as grain, iron, tin, spices, etc. Trebizond is the ancient *Trapezus*, and was founded by a colony from Sinope; it was a flourishing town under the Colchians, when Xenophon arrived there in his famous retreat from Persia. Conquered from Mithridates by the Romans, it rapidly rose in importance, became a free city, was made by Trajan the capital of Pontus Capadocius; and, by the same enlightened ruler, was provided with a larger and better harbor. On the capture of Constantinople by the crusaders in 1204, and the expulsion of the Comnenian emperors, one of the imperial family, Alexis, established himself at Trebizond, where he had previously exercised the functions of governor, and founded a state known as the *Empire of Trebizond*, which stretched from the Phasis to the Halys, and maintained its independence against the Turks till 1462, when the last emperor was defeated and captured by sultan Mohammed II.

TREBLE, the highest part in harmonized music, which in general contains the melody, and is sung by a soprano (q.v.) voice. The treble or G clef  is placed on

the second line of the staff, indicating that the note G occupies the line encircled by its lower curve. It is one of the two clefs in use in music for keyed instruments.

TREDEGAR, a market t., on the n.w. border of Monmouthshire, 18 m. n.w. of Newport. It stands in the midst of a district with extensive iron-works and coal-mines, which give employment to the great mass of the inhabitants. Pop. in '71, 12,389.

TREDGOLD, THOMAS, a celebrated English authority on architecture and engineering, was b. at Brandon, a small village 2½ m. s.w. of Durham, Aug. 22d, 1788. At the age of 14 he was apprenticed for six years to a cabinet-maker; but devoted his leisure time to the study of the principles of architecture, and kindred subjects. In 1808 he went to Scotland, where he worked as a journeyman carpenter for five years; then removed to London to his relative Mr. Atkinson, the architect to the ordnance board, with whom he labored till 1823, by which period his private business had increased so much that he commenced business on his own account as a civil engineer. During the ten years of Tredgold's residence with Mr. Atkinson, he studied with redoubled zeal, and obtained a thorough acquaintance with mathematics, chemistry, mineralogy, and geology. He died from pure exhaustion of nature, Jan. 28th, 1829, at the early age of 40. Tredgold's scientific contributions to periodicals range over a wide field; but his

great and valuable works are: *The Elementary Principles of Carpentry, a Treatise on the Pressure of Beams and Timber Frames, the Resistance of Timber, the Construction of Floors, Roofs, Centers, and Bridges* (4to, 1820; 2d ed., 1828); and *The Strength of Cast Iron* (1821; 2d ed., 1824; 3d ed., 1831). His other works, the *Principles of Warming and Ventilating Public Buildings*, etc. (1824); *Practical Treatise on Railroads and Carriages* (1825); a pamphlet entitled *Remarks on Steam-Navigation*, etc. (1825); and *The Steam-Engine* (1827), were also received with special favor; and of the first and last of them new editions were speedily required.

TREE, the name given to those plants which live for many years, and have woody stems and branches, the stem being generally single, and bearing a head of branches and twigs; whereas shrubs (q.v.) have generally a number of stems springing from one root. The terms tree and shrub are not, however, of very exactly defined signification; and many shrubs, under certain circumstances, assume the form of trees, either naturally or by the help of art; while trees are, in other circumstances, converted into shrubs. The common hawthorn, for example, is very often a mere shrub, but sometimes appears as a tree, with stem and head as perfect as the greatest monarch of the forest. The gooseberry bush is usually trained in our gardens in a tree-like habit, notwithstanding its small size, and the shortness of its stem; this, however, is entirely artificial, its natural habit being that of a shrub, to which, but for the gardener's knife, it would almost certainly relapse in a single year. The greater number of trees are exogenous. Palms are almost the only endogenous plants to which this name can be given. Very different from the ordinary exogenous trees are the gymnogens (q.v.) of Lindley—firs, pines, yews, etc. Trees are found in all climates except the coldest, but the number of species, as well as the luxuriance of the forests, is greatest in the tropics. As we advance toward the polar regions, or ascend high mountains, trees disappear before other forms of vegetation. The different characters of trees affect very much the landscape of the countries in which they grow; some countries, and particularly in northern parts of the world, being covered with somber pine forests, while others abound in ash, beech, and similar trees of verdant foliage. Every kind of tree has its peculiar character, not only in its foliage, but in its general form and its mode of branching. An ash is as easily distinguished from an elm, by a practiced eye, in winter, when destitute of leaves, as in the full foliage of summer. Some trees attain a very great age, but the ordinary duration of life is very different in different species. There are trees in England which are supposed to be more than a thousand years old, and are still healthful and flourishing. Oaks and yews are among the trees of longest life. The baobab of Africa is also regarded as a very long-lived tree.

No acotyledonous plant assumes the character of a tree, except a few ferns, known as tree ferns. See ARBORICULTURE.

TREE-FERNS are ferns with tree-like woody stem, and a head of fronds resembling the leaves of palms. They are found only in tropical and sub-tropical countries, many of which, however, are quite destitute of them. One species, *Alsophila gigantea*, which has a thick black trunk surmounted by a feathery crown, is found in the Himalayas, at an elevation of 7,000 ft., and might be introduced with some probability of success into Britain. The soft central part of the stem of *Cyathea medullaris* is an article of food in New Zealand. Tree ferns are a characteristic feature of the vegetation of New Zealand.

TREE-FROGS, *Hylæ*, a family of *batrachia* (q.v.) separated from the true frogs (*ranidae*) on account of the dilated disks or suckers at the tips of the toes, which are covered with a viscid secretion, and enable the animals to climb trees. Most of them are arboreal: they are of small size, more elegant in form than the true frogs, of brighter colors and more active habits. They feed on insects, which they pursue on the branches and among the leaves of trees or shrubs, stealing toward them, and suddenly springing upon them. They deposit their spawn in water, like other batrachians—some of them on the edges of leaves hanging over water—and hibernate in mud. The day is their time of activity, although they shelter themselves among leaves from very hot sunshine. Their croaking is louder than that of true frogs, and the traveler is sometimes amused by hearing it from the tops of high trees. No species of tree-frog is found in Britain; one occurs in the middle and south of Europe; it is also found in Asia and the north of Africa; the warmer regions of the old world have numerous species, and in America they are still more abundant. Some occur in Australia. The TREE-FROG of Europe (*hyla arborea*)—*rainette* of the French—is found chiefly in moist woods, and in hedges near water. Although a small creature—one of the smallest of European frogs—it can make a spring of more than a yard in height to seize an insect. It becomes very noisy on the approach of rain, and is often kept in confinement to serve as a kind of barometer. Very similar to it is the COMMON TREE-FROG of North America (*H. versicolor*), which is abundant in the middle and northern parts of the United States as far w. as the Mississippi, but is replaced in the s. by the GREEN TREE-FROG (*H. viridis*), while other species are found in different parts of the country.

TREES OF LIBERTY. The custom, common to almost all the nations of Europe, of celebrating the beginning of spring and various national and ecclesiastical festivals by setting up green boughs, led, during the war of independence in the United States, to the habit of planting poplars and other trees as the symbol of growing freedom. This

example was imitated during the French revolution. The Jacobins in Paris are said to have planted the first tree of liberty in 1790; and the custom spread rapidly through the whole of France. These trees, crowned with the cap of liberty, were soon to be found in every village, while the people danced round them, singing revolutionary songs, and regarded them as the rendezvous of the patriots. Poplars were at first employed, but afterward oaks were substituted in their place. This custom was regulated by a decree of the convention, and diffused over foreign countries by the republican armies. During the reign of terror, thousands lost their lives under the pretext of having injured a tree of liberty. During the empire, this custom, like all others that had originated during the republic, was completely suppressed. In the July revolution of 1830, trees of liberty were again set up, particularly at Paris. But the populace took no interest in the matter. During the February revolution of 1848, trees of liberty once more came into vogue at Paris and other places where the inhabitants held republican principles. They were generally hung with tri-colored ribbons, circles, and triangles, the symbols of unity and equality, and surmounted with the cap of liberty. In Paris, on the occasion of erecting a tree of liberty, a priest was frequently conveyed to the spot for the purpose of consecrating it. After most of the trees of liberty had fallen during the conflicts in the streets of Paris in June, 1848, government issued an order for their removal from all places where they impeded traffic. Before the end of the year they had entirely disappeared. Numerous trees of liberty were erected in Italy during the revolution of 1848 and 1849, but fell as the different insurrections were quelled. A learned and interesting treatise has been written on this subject by the abbé Grégoire.

TREFOIL, a name given to many herbaceous plants with leaves of three leaflets, as clover (q.v.), lotus (q.v.), medick (q.v.), buckbean (q.v.), etc.

TREFOIL, in heraldry, is a frequent charge, representing the clover-leaf, and is always depicted as *slipped*, i.e., furnished with a stalk.

TREFOIL, in architecture, a three-lobed aperture in tracery, etc.

TREGELLES, SAMUEL, LL.D., an eminent New Testament critic and editor, was born at Falmouth in 1813. He did not receive a university education, and spent the early part of his life in secular occupation, yet at the age of 25 he had formed the plan of a Greek New Testament, on the principles which he afterward carried out. In preparing for his *magnum opus*, he visited the continent in search of MSS., and published, among other works, an edition of the *Codex Zacynthius*; an *Account of the Printed Text of the Greek New Testament* (1854); and an *Introduction to the Textual Criticism of the New Testament* (1856). His *Critical Edition of the Greek New Testament* was published in 1856-72, and stands, as to manner of treatment, between that of Lachmann and that of Tischendorf. Tregelles goes further than Tischendorf in his dependence upon ancient, and rejection of modern MSS. In 1862 Tregelles received a pension of £100, which was doubled in 1870. He died on April 24, 1875.

TREGO, a co. in w. central Kansas; drained by the Saline and Smoky Hill rivers; traversed by the Kansas Pacific railroad, 900 sq.m. pop. '80, 161—136 of American birth. The surface is nearly level; corn, wheat, oats, rye, hay, and dairy products are the staples. Co, seat, Wa Keeney.

TRELLIS, an open grating or lattice-work, formed in wood, iron, etc.

TREMATODA, or TREMATODE WORMS, constitute, according to Dr. Cobbold's system, the second order of the sub-class *sterelemnintha* (Owen), of the class *helmintha*. In ordinary zoological classification, the trematoda form a division of the group of *platyelmia* or "flat-worms," which group is in its turn included in the class *scolecida*—a division of *echinozoa* or *annuloida*. This order, as the Greek word *trēmātōdes* indicates, is characterized by the possession of certain suckorial pores or openings. All the animals included in it have soft, roundish, or flat bodies, and their visceral organs are lodged in the parenchyma of the body. Most of the trematoda are hermaphrodites. They seldom attain to a large size (the greatest length is about 5 in.), but are usually visible to the naked eye. Like all *scolecida*, the trematoda possess a peculiar system of vessels ramifying through their bodies, and termed the "water-vascular" system.

The trematoda, or flukes, as they are popularly called, from their resemblance in form to small flukes or flounders, are not parasitic during the whole period of their existence; "for, while passing through the cycle of their life-development, they frequently change their residence, at times inhabiting either open waters, or the dewy moisture of low pasture-grounds. They perform active and passive migrations from parasitic to non-parasitic abodes; and during their larval wanderings in search of a final resting-place which should prove suitable to their adult condition, they provisionally occupy the bodies of different kinds of invertebrata."—Cobbold's *Entozoa*, 1864, p. 15. In his *Synopsis of the Distomide* (published in 1861), Dr. Cobbold recognizes 344 species of flukes, of which 126 belong to fishes, 47 to reptiles, 108 to birds, 58 to mammals, and 5 to the invertebrata. He now believes that, at the very lowest possible estimate, we must assume the order to contain 400 species, which may be divided into the five families of *monostomide*, *distomide*, *tristomide*, *polystomide*, and *gyrodactyle*—names which are based, except in the last case, on the number of their pores or oval suckers.

Van Beneden arranges these families into (a) *monogenea* and (b) *digenea*, the develop-

ment in the former being simple, while in the latter there is an alternation of generation, the nurses and larvæ living chiefly in mollusks, while the adult animals chiefly live in the bodies of vertebrate animals. The *monostomidæ* and *distomidæ* belong to the latter, and the others to the former group. The family of *distomidæ* embraces the principal and best-known genera of the order *trematoda*, and its members are at once recognized by the presence of two pores or suckers; one, the anterior, being connected with the mouth; and the other, termed the acetabulum, being usually placed on the ventral surface, in the middle line.

The following members of this order are of special interest, as very liable to infest man: *Fasciola hepatica*, described in the article FLUKE, is not only common in all varieties of grazing-cattle, and especially the sheep, but has been found in the horse and ass, in the hare and rabbit, in the squirrel, beaver, kangaroo, etc., and is occasionally met with in man, not only in the liver and gall-bladder, but beneath the skin in various parts, as, for example, in the sole of the foot, behind the ear, and in the scalp. For an excellent account of the anatomy and development of this parasite, the reader is referred to Cobbold, *op. cit.* pp. 147-169. See ROT. *Distoma lanceolatum* is a species which is by no means uncommon in the sheep and ox, and has been found on at least three occasions in the human subject. *Distoma ophthalmobium* has been occasionally found in the lens of the human eye. *Distoma hematobium*, or *Bilharzia hematobia*, as Dr. Cobbold terms it, is the only known trematode which is not hermaphroditic.

The male is a cylindrical worm, measuring only about half an inch in length; while the female is filiform, longer, and much narrower than the male, being about $\frac{1}{2}$ of an inch in length. The first specimens were found by Bilharz of Cairo in the portal system, and the worm has since been found in the veins of the mesentery, bladder, and other parts. This parasite is common not only along the borders of the Nile, but in south Africa and the Mauritius. It is so common in Egypt that in 363 examinations of the body after death, Griesinger found it no less than 117 times.

The principal feature of the disease caused by this worm consists in a general disturbance of the uropoietic function. Diarrhea and hematuria occur in advanced stages of the complaint, being also frequently associated with the so-called Egyptian chlorosis, colicky pains, anæmia, and great prostration of the vital powers. The true source of the disorder, however, is easily overlooked, unless a careful microscopical examination be made of the urine and other evacuations. If blood be mixed with these, and there also be a large escape of mucus, a minute inspection of the excreta will scarcely fail to reveal the presence of the characteristic ova of *bilharzia*.—Cobbold, *op. cit.* p. 202. Dr. J. Harley has published several excellent papers "On the Hematuria of the Cape of Good Hope, produced by a *Distoma*," which is undoubtedly the *bilharzia*.

Several other trematodes occasionally occur in the human subject.

TREMEL'LA, a genus of fungi, of the division *hymenomyces*, soft and gelatinous, of no very determinate form, mostly growing on decaying wood. Several species are found in Britain. In some places they receive such popular names as witches' meat and witches' butter. Superstitious notions have been connected with them, and a medicinal value altogether imaginary has been ascribed to them.

TREMOLITE a mineral regarded as a variety of hornblende (q.v.). It is composed of silica, magnesia, lime, and a very little fluoric acid.

TREM'OLO, **TREMAN'DO** (Ital. trembling), in music, an expression indicating that a note or a chord is to be reiterated with great rapidity for an indefinite number of times, so as to produce a tremulous sort of effect. In singing, *tremolo* effects may on rare occasions be introduced with advantage, but are often resorted to by inferior singers as an artifice to conceal defects of tone and style.

TREMPEALEAU', a co. in w. Wisconsin; 700 sq.m.; pop. '80, 17,189—10,319 of American birth, 20 colored. Its surface is generally level, a large proportion wood land. Live stock is raised in great numbers. Co. seat, Galesville.

TRE'NAILS, pieces of wood which are used as nails in ship-building. They are usually about 15 or 18 in. in length, and when completed, at least 1 in. in thickness. They are made chiefly of locust-wood (*Robinia pseudo-acacia*), or of oak; the former are imported from North America, the latter from northern Europe. Great Britain imports of these small pieces of wood as much as £5,000 worth annually.

TRENCH. See SIEGE.

TRENCH, RICHARD CHENEVIX, Archbishop of Dublin, divine and scholar of the church of England, belongs to an Anglo-Irish family of Galway, the Trenches of Woodlawn, and was born at Dublin, Sept. 9, 1807. He was educated at Harrow and Trinity college, Cambridge, where he graduated in 1829. After traveling for a few years he became a country curate; and in 1837 or 1838, published two volumes of poetry, which had at least the merit of imitating Wordsworth, and were favorably received. One of the poems, *The Story of Justin Martyr*, is even yet faintly remembered. In 1845, Trench was presented to the rectory of Itchin Stoke; in 1847 he became theological professor and examiner in King's college, London; in 1856 dean of Westminster; and in 1864, on the death of Whately, archbishop of Dublin. Trench has written extensively

and well. He has a quick, keen understanding; his scholarship is varied and choice, though not sufficiently precise or scientific for philological purposes; his fancy, sometimes poetic, and always picturesque, enables him to invest the dry discussion of words with a peculiar fascination; and if the results of his etymological inquiries are not always sure, the processes are invariably pleasant. As a literary critic, Trench is both acute and elegant. His principal works are: *Notes on the Miracles* (1846); *Notes on the Parables* (1841; 12th ed. 1874); *The Lessons in Proverbs* (1853), from all of which his professional brethren have borrowed liberally for the work of the pulpit; *The Sermon on the Mount, illustrated from St. Augustine* (1844); *Sacred Latin Poetry* (1849); *St. Augustine as an Interpreter of Scripture* (1851); *Synonyms of the New Testament* (1854); *The Epistles to the Seven Churches of Asia Minor*; *An Essay on the Life and Genius of Caldron*; *Deficiencies in our English Dictionaries*; *Glossary of English Words used in different Senses* (1859); *The Study of Words* (1851), of which last, 22 editions appeared in America before 1862; *A Memoir of his Mother* (1862); and *Lectures on Medieval Church History* (1878).

TRENCHARD, STEPHEN D., b. N. Y., 1818; became a midshipman in the navy, 1834; served with much credit during the rebellion, rising to the rank of commodore, 1871, and rear-admiral, 1875. In both attacks on fort Fisher, he commanded the *Rhode Island*. In 1869 he was flag-officer of the South Atlantic squadron.

TRENCK, FRANZ AND FREDERICK VON DER, were German barons and soldiers, whose adventures, recorded in autobiographies, have secured for them a world-wide fame. They were cousins, descended from an ancient house of east Prussia, and although placed from infancy under circumstances altogether different, exhibited a striking similarity of character. Both were braggarts, both were subject to fits of uncontrollable passion, and both told premeditated lies.

BARON FRANZ was b. in Reggio, in Calabria, on Jan. 1, 1711, where his father was an Austrian general. When 17 he received a commission as a cavalry officer, fought duels, and cut off the head of a man who refused to lend him money. He had to flee in consequence, and he went to Russia, where he was made a captain of hussars. He was then a formidable young giant of 6 ft. 3 in.; and it is highly probable that he knocked down his commanding officer, as he says he did, for rebuking him. He adds that he was placed under arrest while an engagement was going on; that marshal Münnich happening to pass, he called out that if set free and pardoned he would bring back three Turks' heads in an hour; that he was set free and brought back four Turks' heads suspended from his saddle. The story may or may not be true; but certain it is that he was cashiered not long afterward, and returned to settle on his estates in Croatia. There it is we first meet with the Trench of history. The Turkish frontier was overrun with banditti. Trench armed and drilled 1000 of his tenants, whom he called Pandours, and by their means succeeded in restoring order. He then offered the services of his regiment to Maria Theresa, and his aid was accepted. In 1740 he took part in the Silesian war at the head of his men, and perpetrated the most atrocious deeds of rapine and cruelty. There had been no such monster, says Mr. Carlyle, since Attila and Gerglis. On Sept. 7, 1742, he attacked Cham, a fine trading town in neutral territory, this act being, of course, in defiance of all law and discipline; and he completely annihilated it. After the battle of Sohr, in Sept., 1745, he offered to capture Frederick the great, and bring him a prisoner to the Austrian camp. He failed in the enterprise, with great loss of men, but he secured the king's tent and much valuable booty. Suspicions were, however, entertained of his being in communication with the enemy, and he was tried by court-martial. He was imprisoned at Vienna, but made his escape with the assistance of the baroness Lestock, who bribed the jailers to allow him to be conveyed in a coffin as if dead, beyond the city walls, was again captured at Bruges, and re-imprisoned at Grätz, where he took poison, and died on Oct. 4, 1747.—See Carlyle's *Life of Frederick the Great*; and *Memoires du Baron Franz de Trenck* (Par. 1787), written by himself.

FREDERICK VON DER TRENCK, was born at Königsberg, in 1726, and was the son of a maj. gen. in the Prussian service. He distinguished himself at the university. At 16 he became a cornet in the guards; and two years afterward the princess Amelia, who saw him at a ball, we are told, conceived a violent passion for him. To this he attributed the antipathy the king afterward entertained toward him. There was, however, a much better reason: he was detected in a correspondence with his Austrian cousin, not long before the attempt to capture the king, and arrested. Mr. Carlyle shows that the baron had been in prison three months, and was there when the battle of Sohr took place, although he vividly describes his own adventures in the fight. He was accused of this lie in his own time, and admitted that he must have made a mistake! "He had nothing but his poor agitated memory to trust to." He was released on Dec. 24, 1753, and afterward settled at Aix-la-Chapelle, where he married the burgomaster's daughter, and went into business as a wine-merchant. He published his memoirs in 1787. The book was translated into all languages, and Trenck became the most famous personage of his time. The ladies at Paris, Berlin, and Vienna wore bonnets, dresses, and rings *à la Trenck*; and no less than seven plays, founded on his adventures, were brought out on the French stage. In 1792 he went to Paris, and became a zealous adherent of the

mountain party. He was, however, suspected, and thrown into prison. Soon after, rumors in circulation among the prisoners that the Prussians were advancing on Paris, and carrying all before them, were traced to Trenck, who was in consequence condemned. He was guillotined near the Barrière du Trône, July 26, 1794. On the scaffold, although 69 years of age, he manifested the ungovernable passion which had characterized him through life. He harangued the mob; and at length the executioner had by force to hold his head by the gray hair on the block, to meet the fatal stroke.—See Chambers's *Book of Days*, vol. i. p. 261; Carlyle's *Frederick the Great*, vol. iv.; *Friedrich Trencks Merkwürdige Lebensgeschichte von ihm selbst beschrieben* (2 vols. Berl. 1787); and *Leben und Thäten der Trenke*, by Watermann (2 vols. Leip. 1837).

TRENDELENBURG, FRIEDRICH ADOLF, 1802-72; b. Germany; educated at the universities of Kiel, Leipsic, and Berlin; appointed professor extraordinary of philosophy in the university of Berlin, 1833, and full professor, 1837. This position he held until his death. During the greater part of this period he held a governmental office in connection with the public schools. In the university he lectured to large classes on psychology, logic, history of philosophy, ethics, philosophy of law, and theory of teaching. His criticism on Kant involved him in controversies, while his assault upon Hegel procured him great renown, and did much to break the hold of Hegelianism on the German mind. The foundation of his own philosophic doctrine is Platonic and Aristotelian. He derives the principle for a philosophic deduction of the sensible universe from Aristotle's conception of motion, as subject to the principle of design or to Plato's *idea*. The teleological view he held and developed as illustrated and confirmed by empirical fact. Mechanical causation he viewed as the servant of teleology, not its enemy. He calls his philosophy the "organic view of the world." Each lower stage in existence is the basis of the higher stages, and is involved in them. The highest stage experimentally known to men is the ethical, or the development of man in his totality; where his supreme end is intellectually apprehended, and is realized by man's own action. The soul is the self-realizing idea of man; God is the unconditional; not directly demonstrable but logically implied in the whole fabric of the universe and of human thought.

TRENT, a river of the midland counties of England, rises on the n.w. border of Staffordshire, about 10 m. n. of Burslem, and at a height of about 600 ft. above sea-level. It flows first s.e. to the border of Derbyshire, and afterward in a general n.e. direction, through the counties of Derby, Nottingham, and Lincoln, to a point about 8 m. e. of the town of Goole, where it unites with the Ouse (q.v.) to form the Humber (q.v.). It receives the Derwent, Idle, and Tarn from the w., and the Soar from the s.; its length is 170 m., for 120 m. of which, from its mouth up to Burton-on-Trent, it is navigable for barges.

TRENT (Ital. *Trento*, Ger. *Trient*, Lat. *Tridentum*), a walled t. of Austria, in the southern part of the Tyrol, capital of the circle of the same name, is situated on the left bank of the Adige (here spanned by a wooden bridge 146 ft. long), in a beautiful and fertile valley, surrounded by high limestone hills, 46 m. n. of Verona. In its general aspect, as well as its architecture, Trent is quite an Italian town; and with its spires and towers, ruined castles and ancient embattled walls, it presents an imposing appearance from a distance. The *piazza grande*, near the cathedral is adorned with a splendid fountain of red marble, surmounted by a colossal statue of Neptune with his trident. The cathedral, begun in 1212, is a beautiful specimen of the Romanesque style of Lombardy, with a few features suggestive of the contemporary German style; united to it is a fragment of the episcopal palace of the 12th century. The church of Santa Maria Maggiore is built on the site of the council-chamber in which the famous "council of Trent" held its sittings. Among other public buildings are the church of the Jesuits, ornamented with the richest foreign marble; the new theater (holding 1400 people); the town-hall; and the Palazzo Buonconsiglio adjoining the town, a noble specimen of the feudal architecture of north Italy, now occupied as a barracks. Its benevolent and educational establishments are numerous. Trent carries on considerable manufactures of silks, wine, tobacco, and sugar, and has a large transit trade. Pop. '69. 17,073.

The ancient *Tridentum*, or *Tridente*, derived its name from the *Tridentini*, an Alpine tribe, whose capital it was, and has, in all probability, no connection whatever with the trident of Neptune (as is commonly supposed). Conrad the Salic bestowed on the prince-bishops of Trent the temporal rule of the valley of the Adige, and under them Trent rose to great prosperity and importance. It is still the see of a prince-bishop.

TRENT, COUNCIL OF, the most celebrated of the assemblies regarded by the Roman Catholic church as ecumenical or general, and the great repository of all the doctrinal judgments of that communion on the chief points at issue with the reformers of the 16th century. Very early in his conflict with pope Leo X., Luther had appealed from the pope to a general council; and after the failure of the first attempts at an adjustment of the controversies, a general desire grew up in the church for the convocation of a general council, in which the true sense of the church upon the controversies which had been raised might be finally and decretorially settled. Another, and, to many, a still more pressing motive for desiring a council, was the wish to bring about the reform of the alleged abuses as well of the court of Rome as of the domestic discipline and government of local churches, to which the movement of the reformers was in part at least

ascribed. But the measures for convoking a council were long delayed, owing partly, it has been alleged, to the intrigues of the party who were interested in the maintenance of those profitable abuses, and especially of the officials of the Roman court, including the cardinals, and even the popes themselves; but partly also to the jealousies, and even the actual conflicts, which took place between Charles V. and the king of France, whose joint action was absolutely indispensable to the success of any ecclesiastical assembly. It was not till the pontificate of Paul III. (1534-49) that the design assumed a practical character. One of the great difficulties regarded the place of meeting. In these discussions much time was lost; and, without entering into detail, it will suffice to say that the assembly did not actually meet till Dec. 13, 1545, when 4 archbishops, 22 bishops, 5 generals of orders, and the representatives of the emperor and the king of the Romans, assembled at Trent, a city of the Tyrol. The number of prelates afterward increased. The pope was represented by three legates, who presided in his name—cardinals del Monte, Cervino, and Pole. The first three sessions were devoted to preliminaries. It was not till the fourth session (April, 1546) that the really important work of the council began. It was decided, after much disputation, that the doctrinal questions and the questions of reformation should both be proceeded with simultaneously. Accordingly, the discussions on both subjects were continued through the fourth, fifth, sixth, and seventh sessions, in all which matters of great moment were decided; when a division between the pope and the emperor, who, by the victory of Mühlberg, had become all powerful in the empire, made the former desirous to transfer the council to some place beyond the reach of Charles's arbitrary dictation. The appearance of the plague at Trent furnished a ground for removal, and in the eighth session a decree was passed (Mar. 11, 1547) transferring the council to Bologna.

This translation was opposed by the bishops who were in the imperial interest, and the division which ensued had the effect of suspending all practical action. Meanwhile, Paul III. died. Julius III., who had, as cardinal del Monte, presided as legate in the council, took measures for its resumption at Trent, where it again assembled May 1, 1551. The sessions 9 to 12, held partly at Bologna, partly at Trent, were spent in discussions regarding the suspension and removal; but in the 13th session the real work of the assembly was renewed, and was continued, slowly, but with great care, till the 16th session, when, on account of the apprehended insecurity of Trent, the passes of the Tyrol having fallen into the hands of Maurice of Saxony, the sittings were again suspended for two years.

But the suspension was destined to continue for no less than nine years. Julius III. died in 1555, and was followed rapidly to the grave by his successor (who had also been his fellow-legate in the council as cardinal Cervino), Marcellus II. The pontificate of Paul IV. (1555-59) was a very troubled one, as well on account of internal difficulties as owing to the abdication of Charles V.; nor was it till the accession of Pius IV. (1559-65) that the fathers were again brought together to the number of 102, under the presidency of cardinal Gonzaga, re-opening their deliberations with the 17th session. All the succeeding sessions were devoted to matters of the highest importance—communion under one kind; the sacrifice of the mass; the sacrament of orders, and the nature and origin of the grades of the hierarchy; marriage, and the many questions connected therewith. These grave discussions occupied the sessions 17 to 24, and lasted till Nov. 11, 1563. Much anxiety was expressed on the part of many bishops to draw the council to a conclusion, in order that they might be enabled to return to their sees in a time so critical; and accordingly, as the preliminary discussions regarding most of the remaining questions had already taken place, decrees were prepared in special congregations comprising almost all the remaining subjects of controversy, as purgatory, invocation of saints, images, relics, and indulgences. Several other matters, rather of detail than of doctrinal principle, were referred to the pope, to be by him examined and arranged; and on the 3d and 4th of Dec., 1563, these important decrees were finally read, approved, and subscribed by the members of the assembly, consisting of 4 cardinal legates, 2 other cardinals, 25 archbishops, 168 bishops, 7 abbots, 7 generals of orders, and 39 proxies of bishops—making in all 252.

These decrees were confirmed, Jan. 10, 1564, by Pius IV., who had drawn up, based upon them in conjunction with the creeds previously in use, a profession of faith known under his name. See ROMAN CATHOLIC CHURCH. The doctrinal decrees of the council were received at once throughout the western church, a fact which it is necessary to note, as the question as to the reception of the decrees of doctrine has sometimes been confounded with that regarding the decrees of reformation or discipline. As to the latter, delays and reservations took place. The first country to receive the decrees of the council as a whole was the republic of Venice. France accepted the disciplinary decrees only piecemeal and at intervals.

It would be out of place here to enter into the question as to the merits of this unquestionably great and momentous assembly, which may be said to have practically decided the religious destinies of the western church. It is viewed with directly opposite impressions by opposing critics, and it is commonly even said that in the Catholic church itself the council of Trent has met its worst adversary in the person of one of the priests of its own creed, the Servite monk, Fra Paolo Sarpi.

It must be confessed, however, that the most candid of modern inquirers have shown

that Sarpi cannot fairly be regarded as a Roman Catholic. His sympathies are all strongly anti-Roman, and there are abundant indications in his work of a rationalizing tendency, which plainly ought to rank him among the partisans of that free inquiry which it has been the object of Trent to repress by judgment, pronounced once for all, and excluding all controversy. See SARPI. And although there are, perhaps, equal exceptions against the impartiality of his rival historian and antagonist, Pallavicino, the latter is admitted by Ranke, Raumer, and others to be far more reliable in the use of documents than his Servite adversary.

The canons and decrees of the council of Trent were issued in Latin, and have been reprinted innumerable times. They have also been translated into almost every modern language; the most approved English translation being that of the Rev. Jeremiah O'Donovan. One of the supplementary works assigned to the pope by the council at its breaking up was the completion of a catechism for the use of parish priests and preachers. This work has not all the authority of the council, but it is of the very highest credit, and is extensively used, having, like the canons and decrees, been very generally translated. Another similar work was the publication of an authentic edition of the Vulgate version of the Bible, as well as of the missal and breviary. All these have been accomplished at intervals; and there is besides at Rome a permanent tribunal, a congregation of cardinals, styled *Congregatio Interpres Concilii Tridentini*, to which belongs the duty of dealing with all questions which arise as to the meaning, the authority, or the effect of the canons and decrees of this celebrated council. See SARPI, PIUS IV., PALLAVICINO.

TRENTON, the capital city of New Jersey, on the left bank of the Delaware river, at the confluence of Assumpink creek, and head of steam navigation, 30 m. n.e. of Philadelphia, and 57 s.w. of New York; a well-built and handsome city, with a fine view of the river. It contains the state capitol; state lunatic asylum, for 600 patients; state normal school; penitentiary, with 350 inmates; state library, of 20,600 vols.; 34 churches; 6 daily newspapers; extensive railway connections; and manufactories of locomotives, machinery, cannon, rifles, wire, wire-cordage, crockery, terra-cotta, cotton, woolen, paper, etc. In the war of the revolution Trenton was the scene (Dec. 25, 1776) of a night attack by Washington upon the British troops—chiefly Hessians—whom he surprised by crossing the Delaware, when the floating ice was supposed to have rendered it impassable. Pop. '70, 22,874.

TRENTON FALLS, a village of New York, on West Canada creek, 15 m. n.w. of Utica, celebrated for its beautiful cascades (6 in number), with an aggregate fall of 312 ft., in a deep ravine, 2 m. long, with walls of rock in places 150 ft. high.

TRENTSCHIN, a co. in n.w. Hungary, containing famous mineral springs, and one of the oldest and strongest castles in Hungary; 1784 sq.m.; pop. about 248,626. Capital, Trentschin.

TREPAN. See TREPHINE.

TREPANG. See BÊCHE-DE-MER.

TREPHINE AND TREPHINING. (The instrument in its original form was called a *trepán*, from Gr. *τροπαν*, allied to Lat. *tereo*, to bore; the now usual form is called a *trephine*). The operation of trephining consists in the perforation of a bone by means of a trephine, which is a small cylindrical or circular saw, with a center-pin on which it works. It is practiced on the skull in cases of fracture: "1st, when a portion of the bone is depressed, and encroaches on the cavity of the skull, producing compression of the brain, and the fragment cannot otherwise be raised; 2dly, for punctured fractures by which the inner table is splintered, separated from the outer table, and lying loose on the dura mater; and 3dly, for effusion of blood, or of inflammatory products between the bones and membranes, or between the latter and the brain, when it is presumed that the effused fluid may be evacuated by the opening."—Holmes's *System of Surgery*, vol. iv. p. 1044. It has likewise been employed in epilepsy, with the view of removing an assumed local cause of disturbance; but it is not likely to be ever again used in that disease, as it is now an established axiom, that as the operation itself may destroy life, its application is not justifiable, except as the last resource of surgery in extreme cases.

Attempts have been made by various surgical-instrument makers to regulate the action of the trephine by means of a movable collar, so as to prevent the brain from being injured after the skull has been perforated. For the method of applying the instrument we may refer to any work on operative surgery.

TRESPASS as a legal term, in the law of England, means any wrong or injury committed upon either the person or property of an individual, not amounting to a crime. As regards a trespass to the person, the more familiar term is an assault or imprisonment; but trespass as to goods and chattels is more commonly known under the names of the remedies applied, as, for example, actions of trover (q.v.), detinue (q.v.). Trespass is the technical as well as popular name for that kind of injury which is done to a man's land or house by intruding into it against his will. In English law, the maxim is well known that every man's house is his castle, and he is entitled to treat as an enemy any person who attempts to enter without his leave. There are, however, a few exceptions to this rule of the inviolability of a man's house, for it is no protection against the

officers of the law when executing criminal process—for example, coming to apprehend a person charged with crime. But, as regards mere civil warrants, the officers of the law have no right to break open a man's outer door in order to effect an arrest for debt; and no civil court can give the bailiff such a power. The consequence is, that the bailiff can only wait outside, or endeavor by some stratagem to get inside the house in a peaceable manner; and if once inside the outer door, he can then break his way through the house, in order to find his debtor. Such is the law as to intruding into a man's house armed with the authority of the law.

It is a general rule applicable to a man's house as well as land, that if a stranger enter without leave, and do not quit at the request of the owner (who is not bound to state any reason for his request), the owner may by force eject the intruder. In doing so, however, he must not use more force than is necessary to overcome the resistance offered. If the intruder enter with force, the owner may turn him out without even first requesting him to depart; but if the intruder enter quietly, he must first be requested to leave before hands can be put upon him. If, in turning a stranger out, the stranger assault the owner, then the latter may defend himself; but a policeman cannot interfere, or rather it is not compulsory upon him to interfere, unless he sees an assault committed by the intruder. Sometimes it is erroneously believed that a person is entitled to go to another's house on lawful business, and insist on admission, and even to remain till he get an answer—such as a creditor to demand his money; but this is not so. A creditor may be ordered away, and has no more right to intrude than any stranger. It is also sometimes erroneously supposed that any member of the public is entitled to enter into certain public places, such as a shop or a theater; but this is not so. Any shop-keeper can turn any person he pleases, at any moment, out of his shop, and is not bound to deal with any person except he chooses. So with a keeper of a theater or other place commonly described as public places. There is an exception, however, as to an inn-keeper (q. v.), who is bound, if he have accommodation and the means, to admit a traveler requiring refreshment. As to all other places, the general rule is, that whoever is the occupier of a house, or of land, is exclusively entitled to possession, and can extrude any person who refuses on request to leave, or if he prefer to resort to his legal remedy, he can sue such intruder in an action of damages. The amount of damages recovered will depend greatly on the circumstances attending the trespass, and whether insult or outrage was an accompaniment.

It is often erroneously believed by the public, as well as by some landlords or occupiers, and it is probably a wholesome delusion, that it is a criminal offense for a stranger to trespass upon lands, and that such stranger can be given into custody for doing so; and to keep up this impression, it is common for landlords or occupiers to stick up a notice with the words: "Trespassers will be prosecuted." But the fact of such a notice, or of there being a fence to the land, does not make any difference with regard to the trespasser, who is just as much liable to an action of damages, but to nothing else, for the trespass, whether he knew or not of such notice; and in neither case, can he be given into custody, as if for a criminal offense. If, however, a trespasser were to break the trees, or do willful damage (other than mere walking or riding) he may be liable to be apprehended; and if he is at the time trespassing with intent to catch or kill game, he may in some cases be apprehended and given into custody. See GAME, POACHING. It is a defect in the law that owners of land have no summary remedy except physical force to turn out or keep off trespassers, and that justices of the peace have no power to impose a moderate fine upon trespassers for repeating acts of trespass after notice that the owner or occupier dislikes them.

Not only human beings are trespassers, but the word is also by analogy applied to the trespasses of dogs, cats, and other animals. The trespasses of cattle are often of importance, in consequence of the damage done by them. The rule of law which governs the rights of occupiers of land on that subject is the following. An owner is not bound to fence his land, and whether fenced or unfenced, a neighbor is bound neither to trespass himself nor allow his cattle to trespass. If, therefore, A's cattle trespass on B's land, B can impound them; that is, he can lock them up, and keep possession till the owner pay for the damage done; or, if he prefer it, he can bring an action to recover the damages; or, he may drive them off, and also bring the action, until by one or other remedy he is satisfied. With regard to dogs, cats, and similar domesticated animals, the rule is, that the owner is merely responsible for such mischief as they commit by reason of some negligence on his part. If, for example, he knows of some bad propensity they have to stray and attack or damage third persons, then it becomes his duty to take such means as will prevent their doing the mischief; but he cannot be held responsible unless and until the animals have on a former occasion done the mischief—in other words, it is only for a second and not a first offense that he can be made liable. There is one exception only to this rule, recently created by statute, viz., where dogs trespass and worry sheep; in that case, by a recent change made in the law of the United Kingdom, the owner of the dog is to pay for the damage, though he was not aware of any propensity in the dog to do such mischief.

In order to guard against trespass both of men and animals, the owners of land have sometimes resorted to spring-guns and man-traps, planted in their grounds. This practice was carried to a great height in England, as well as Scotland, about forty years ago.

It was decided by the courts in England that there was nothing to prevent an owner from so protecting his land; but to put a limit to it, a statute was passed which restricted such right to dwelling-houses and gardens; so that now in England, it is illegal to place man-traps and spring-guns in open fields. As regards, however, traps to catch dogs, cats, or other animals, an owner of land is entitled to place these in his lands, and even to allure the animals with bait, so as to invite them to their doom; but this must not be done so close to a highway as to tempt a dog aside which is lawfully passing along the highway, for the owner of a dog, being entitled to the use of the highway for the dog as well as for himself, is entitled to have no danger placed in its way, such as a strong-smelling bait, which should operate irresistibly on its animal instincts. It is, therefore, only in the open fields or woods not adjoining the highway, that these dog or cat traps can be lawfully placed for protection of game or otherwise.—In Scotland, the law is substantially the same as regards trespass as it is in England or Ireland; but it was held illegal at common law in Scotland to put man-traps in lands by way of protection; and it is still illegal to do so. In Scotland, also, there is a more summary remedy against trespassers than exists in England, for an interdict may be obtained to prevent mere trespassers, irrespective of the game or fishery laws; and even justices of the peace may deal summarily with mere trespassers.

TRESSURE, in heraldry, a subordinary, generally said to be half the breadth of the orle, and usually borne double, and flowered and counter-flowered with fleurs-de-lis. It forms part of the royal insignia of Scotland, which are: or, a lion rampant gules, armed and langued azure, within a double tressure flory counterflory of the second. The origin of the tressure in the arms of Scotland has been traced by the older heralds to the 9th c., when they relate that it was granted by Charlemagne to king Achaius of Scotland, in token of an ancient alliance between France and Scotland, and with the view of indicating that the French lilies would in time coming be a defense to the Scottish lion. Chalmers insinuates that these two monarchs were probably not aware of each other's existence; and, in point of fact, the double tressure is not known to have been borne earlier than the time of Alexander III., on whose seal it appears. The tressure is, however, held in great honor in Scottish heraldry, and Lyon king-of-arms has not been permitted to grant it to any subject without a royal warrant; as a mark of especial favor, it has, however, occasionally been accorded by the sovereign to the representatives of important families directly descended by a maternal ancestor from royalty, or who had deserved well of their king and country.

TREVELYAN, Sir CHARLES EDWARD, b. England, 1807; educated at the Charterhouse and Haileybury college; entered the East India company's civil service, and was employed under lord W. Bentinck and lord Auckland. Through his efforts in the cause of native education the government was led to engage in the promotion of European literature and science among the natives. In 1840 he was appointed assistant secretary to the treasury, and in 1848 made knight commander of the Bath; governor of Madras, 1859; and received from the queen's government thanks for his valuable services; was appointed, 1862, financial minister in India, resigning in 1865 on account of ill-health. Important reforms were made in the system of accounts during his financial administration, and the resources of India developed by a great extension of public works. He was created a baronet in 1874. He is the author of *Education of the People of India*; the *Irish Crisis*.

TREVELYAN EXPERIMENT (so called from the person who first carefully studied the phenomenon). When a block of iron or copper is considerably heated, and laid on a block of cold lead, a sound of some intensity, and more or less musical, is often heard. Trevelyan, after many trials, adopted for the "rocker," as it is called, a form somewhat resembling a fire-shovel, with a thickish block of metal instead of the blade. This is poised delicately on the lead block, so as to bear nearly equal pressure on two points separated by a groove; and the rounded end of the handle is also supported. The rocker being heated, suppose it poised so as to touch the lead at one point. It heats the lead at this point and therefore suddenly expands the metal near it, since lead is a bad conductor of heat. Thus, the lead, as it were, swells up at one point and tilts the rocker over to the other. There the same process takes place, and so on; and as the rocker thus moves alternately from one point to the other, the successive impacts, occurring at nearly equal intervals, form a musical sound. This can be altered at pleasure by loading the rocker, or by altering its moment of inertia. By proper care, almost any conducting body may be made thus to rock upon another, though, in the majority of combinations, the effect is very slight. The explanation of the phenomenon, as given above, is due to Faraday.

TRÈVES (Ger. *Trier*, Lat. *Augusta Trevirorum*), a t. of Rhenish Prussia (pop. in '71. 21,442; in '75. 32,972), capital of the circle of the same name, lies on the right bank of the Moselle, in a lovely valley, between vine-covered hills, about 65 m. s.w. of Coblenz. The river is here crossed by a bridge of 8 arches, 730 ft. long, and 25 broad. Trèves is a decayed place, and covers an area large in proportion to its population, owing to the number and size of the open spaces where houses once stood. The cathedral of St. Peter and St. Helen is a very interesting structure of various antiquity, principally of the early German Romanesque style of the 11th c., but retaining considerable remains in the

interior of a previously existing Roman church of the age of Constantine. It has beautiful altars and tombs; rich old chasubles and missals; famous relics, among others the "holy coat" (q.v.). Adjoining the cathedral is the *Liebfrauen-kirche*, a very graceful specimen of early German Gothic architecture, finished in 1243. The only other ecclesiastical buildings of interest now remaining, are the chapel of the Benedictine convent of St. Mathias outside the town, and the church of the Jesuits. Trèves contains some beautiful old dwelling-houses of Romanesque architecture. No place in Germany is so rich in remains of the Roman period. Among these are the *Porta Nigra*, a colossal gateway, probably one of the five gates by which Trèves was entered in Constantine's time, the so-called Roman baths (more probably part of an imperial palace), and a basilica built of Roman brick by Constantine for a court of justice, which, after being successively the residence of the Frankish kings and archbishops, was in a great measure demolished to make room for an electoral palace erected in 1614; this has recently been removed, and the basilica restored and fitted up as a Protestant church. Beyond the walls are the ruins of an amphitheater. The piers of the already-mentioned bridge, consisting of enormous blocks of lava, are also of the Roman period.

Trèves is the seat of a bishop, and of a provincial council, has a chamber of commerce, a priestly seminary, gymnasium, a library of 96,000 vols. and numerous MSS., a museum full of valuable antiquities—including the famous *Codex Aureus*, or MS. of the Gospels in gold letters, presented to the abbey of St. Maximin by Ada, sister of Charlemagne—and various benevolent institutions; and it carries on manufactures of woollens, cottons, and linens, besides a brisk trade in corn, timber, and Moselle wines.

Trèves derives its name from the *Treviri* or *Treveri*, a Gallic, or more probably, a Belgic people, who inhabited, in Cæsar's time, a large tract of country between the Meuse and the Rhine. Their capital, *Augusta Trevirorum*, probably became a Roman colony in the time of Augustus, and ultimately became the head-quarters of the Roman commanders on the Rhine, and a frequent residence of the emperors, particularly of Constantine. Under the Franks, into whose hands it fell 463 A.D., it continued to flourish. In 843 it passed to Lorraine; in 870, to Germany; in 895, back to Lorraine; and finally was united to Germany by the emperor Henry I. The archbishop of Trèves was, in virtue of his office of chancellor of Burgundy, one of the electors of the empire, a right which seems to have originated in the 12th or 13th c., and continued till the French revolution. The ambition and talents of some of these episcopal rulers obtained for them great political weight in Germany. Since 1814 Trèves has belonged to Prussia.—See Haupt, *Treves's Vergangenheit und Gegenwart* (2 vols. Trier, 1822); Steiniger, *Geschichte der Trevirer unter der Herrschaft der Römer* (Trier, 1845); and Braun, *Treue und seine Alterthümer* (Trier, 1854).

TREVISO, a province in Italy, adjoining Belluno, Friuli, Vicenza, Padua, and Venice; 929 sq. m.; pop. about 300,000. The surface is in most part an exceedingly fertile plain, that part only which lies n. of the town of Treviso being hilly. The province is drained by the Piave and Livenza rivers; silk, wool, wine, fruit, corn, and cattle are the staples; paper is manufactured. Besides Treviso, the capital, Asolo, Oderzo, Castilfranco, and Ceneda are the chief towns.

TREVI SO, a t. of Italy, capital of the province of the same name, on the river Sile, in a very fertile country, 17 m. n. of Venice. It is the seat of a bishop, and has a handsome and but recently finished Duomo, with five cupolas, and having an altar-piece of the annunciation by Titian; and among the other buildings are the old Gothic church of San Nicolo (with a number of excellent pictures), the public library (30,000 vols.), and a fine theater. The town is surrounded by a wall of from 24 to 38 ft. in height, and strengthened by numerous bastions. Manufactures of hardware are carried on; there are also a sugar refinery, a bell-foundry, and a number of paper-mills. Pop. of town, '72, 18,547.

TREVITHICK, RICHARD, 1771-1833; b. England; an engineer in the Cornwall mines. He made various improvements in steam engines, and introduced high-pressure steam in place of the condensing action. In 1804 a locomotive of his construction drew 10 tons at a rate of 5 m. per hour. His engine exploded, however, and no practical application of the invention was made. He afterward made many inventions and improvements in machinery, such as floating docks, a hydraulic-engine, and warning apparatus.

TREVOR, Sir JOHN, Knight, b. in 1633. In the parliament of James II. which met on May 19, 1685, he was elected speaker of the house of commons. "Trevor," says Macaulay, "had been bred half a pettifogger, and half a gambler, had brought to political life sentiments and principles worthy of both his callings, had become a parasite of the chief justice" (Jeffreys), "and could on occasion imitate not unsuccessfully the vituperative style of his patron. The minion of Jeffreys was, as might have been expected, preferred by James, was proposed by Middleton, and was chosen without opposition."—*History of England*, vol. i. p. 508 (ed. 1849). In the same year, he was made master of the rolls. He contrived to maintain his political and judicial position after the revolution of 1688, and was again elected speaker on the meeting of parliament on Mar. 20, 1690, on an understanding with the government that he was to take the management of what may fairly be called the bribery department. At the same time, he

acted as first commissioner of the court of chancery, in which position his integrity seems from the first to have been greatly suspected; and though he was deficient neither in learning nor in parts, his judgments were both long in being given, and contemptible when they were pronounced. For some years, he maintained both his power and position; but his greed and venality at length became so notorious that respectable gentlemen of all shades of political opinion were ashamed to see him in the chair. In March 1695, a committee of the house of commons was appointed to investigate into the truth of certain charges of bribery brought against their speaker. Within a week, the committee reported, that in the preceding session, sir John Trevor had received 1000 guineas from the city of London for expediting a local bill. As soon as the report had been read in the house, it was moved that the speaker had been guilty of a high crime and misdemeanor. He had himself to stand up and put the question. There was a loud cry of "aye." He called on the "noes." Scarcely a voice was heard. He was forced to declare that the "ayes" had it. Even his "callous heart and brazen forehead" were unable to stand the unspeakable ignominy of his position. Had he returned to the house on the following day, he would have had to put the question on a motion for his own expulsion; he pleaded illness, and shut himself up in his bedroom. A few days afterward, he was formally expelled. He still, however, retained the mastership of the rolls, "to the great encouragement," says North, "of prudent bribery forever after." "His profligacy and insolence united," says Macaulay, "had been too much even for the angelic temper of Tillotson, who had been heard to mutter something about a knave as the speaker passed him." There are anecdotes of him in Noble's continuation of Granger's *Biographical History*, vol. i. p. 172. He died May 20, 1717, and was buried in the Rolls' chapel.

TRIAD, HINDU. See TRIMŪRTI, *ante*.

TRIADS (in chemistry). Until recently, the terms *equivalent number* and *atomic weight* were usually regarded by chemists as synonymous. Many recent writers, among whom Laurent (see his *Chemical Method*, translated by the Cavendish society) stands pre-eminent, have, however, shown that there is an essential difference between them; and this difference is fully recognized by prof. Miller, who, in the latest edition of his *Chemical Physics*, 1863, thus defines it: "The equivalent or combining proportion is an experimental constant which is independent of theoretical considerations; but the relative atomic weight is necessarily a matter of inference, and may be a number, often a multiple of the equivalent, and selected by the chemist from theoretical considerations, which, being based partly upon the law of gaseous volumes, partly on chemical grounds, partly on the phenomena of specific heat, seem to require that the atomic weights of a large number of the elements, if compared with the atomic weight of hydrogen, should be double of those commonly given.—P. 22. Most chemists of the modern school now agree in arranging the elementary bodies in four groups; namely, 1. *Monad* or *unequivalent* elements (or *monads*), one atom of which in combination is equivalent to H_1 , or one atom of hydrogen. In these, the atomic and equivalent numbers are identical. They are twelve in number, and include hydrogen, chlorine, bromine, iodine, silver, etc. 2. *Dyad* or *biequivalent* elements (or *dyads*), each atom of which, in combining with other bodies, is equivalent to H_2 , or two atoms of hydrogen. In these, the atomic number is double the equivalent number. This group embraces 25 elements, including oxygen, sulphur, selenium, iron, zinc, etc. 3. *Triad* or *terequivalent* elements (or *triads*), each atom of which, in combining with other bodies, is equivalent to H_3 , or three atoms of hydrogen. In this group, which embraces nine elements, including nitrogen, phosphorus, arsenic, etc., the atomic and equivalent numbers are regarded as identical, except in the case of aluminium and rhodium, when the atomic number is doubled. 4. *Tetrad* or *quadreequivalent* elements (*tetrads*), each of which, in combining with other bodies, represents H_4 , or four atoms of hydrogen. Their atomic number is double the equivalent number. They are eight in number, including carbon, silicon, tin, etc.

This arrangement of the chemical elements, which is being adopted in all the most recent text-books, has led to the insertion of what are termed *dashed symbols*, in which the number of dashes which are attached to the symbol for the atom of an element indicates its equivalency or interchangeable value for hydrogen. Thus, Ag is marked with a single dash, to show that silver is a monad, or, in other words, that the atom of silver may be substituted for an atom of hydrogen, so as to combine with an atom of chlorine, the resulting compound being $Ag^{\cdot}Cl$ (chloride of silver); Cu is marked with two, Bi with three, and Si with four dashes, to indicate that they are dyads, triads, and tetrads respectively, or that the atoms of copper, bismuth, and silicon may be substituted for two, three, and four atoms respectively of hydrogen, so as to combine with two, three, and four atoms of chlorine, forming $Cu^{\cdot\cdot}Cl_2$ (chloride of copper), $Bi^{\cdot\cdot\cdot}Cl_3$ (chloride of bismuth), and $Si^{\cdot\cdot\cdot\cdot}Cl_4$, or $Si^{\cdot}Cl_4$ (chloride of silicon). These dashed symbols are rapidly coming into general use.

TRIAL, as a legal term, applies most frequently to trial by jury (q.v.), whether in a civil or criminal matter. See PROSECUTOR.

TRIAL AT BAR is a jury trial which takes place before the full court of four judges, instead of one judge only. It is seldom resorted to, and leave must be given in each case on special grounds.

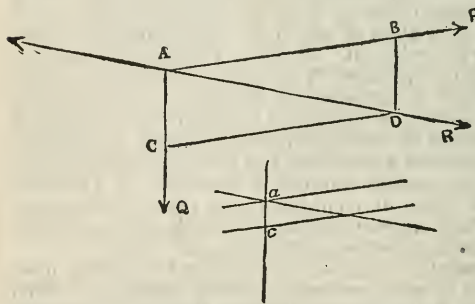
TRIANGLE (*tres*, three, *angulus*, a corner), the most simple of geometrical figures, is a figure having three angles; but, oddly enough, it is generally defined by geometers as a figure of three sides, and its property of being three-angled is put in the subordinate position of a necessary consequence. It may be that this arises from Euclid's use of the word *tripleuron* (three-sided) in the definitions prefixed to his *Elements*; while *trigōnon* (three-angled) is employed in the work itself.

In plane geometry, a triangle is bounded by three straight lines; and triangles are classed according to the relative length of their sides, into *equilateral* or equal-sided; *isosceles*, or having two sides equal; and *scalene*, or unequal-sided, the equality or inequality of the sides carrying with it the equality or similar inequality (of *greater* or *less*) of the angles respectively opposite to these sides, though the *ratio* of inequality of the sides by no means corresponds to that of the angles. Considered with reference to the size of its angles, a triangle is *right-angled* when one of its angles is a right angle (90°); *obtuse-angled*, when it has one angle greater than a right angle; and *acute-angled* when it has no angle so great as a right angle; the well-known property, that the sum of the angles of a triangle is equal to two right angles, preventing the possibility of more than one of them being as great as a right angle. For the relations between the sides and angles of a triangle, see **TRIGONOMETRY**. The triangle being the fundamental figure of plane geometry, through which the properties of all other figures have been arrived at, the investigation of its properties has always been held to be of primary importance. Of the immense number of results obtained by investigation, we can notice only two or three in this place. The lines joining the angles of a triangle with the points of bisection of the opposite sides, intersect at the same point, as also do the perpendiculars from the angles on the opposite sides, the lines bisecting the angles, and the perpendiculars from the middle points of the sides. The point of intersection of the first series of lines is the center of gravity of the triangle; those of the third and fourth series are the centers of two circles, the former of which touches the sides internally, and the latter passes through its three angular points. Another remarkable property of triangles, known as Napoleon's problem, is as follows: if on any triangle three equilateral triangles be described, and the centers of gravity of these three be joined, the triangle thus formed is equilateral, and has its center of gravity coincident with that of the original triangle. See also **TRIGONOMETRY** and **HYPOTHENUSE**. The area of a triangle is half of that of a parallelogram which has the same base and altitude, and is thus equal to half the product of the base into the altitude; it may also be expressed by the formula

$\sqrt{S(S-a)(S-b)(S-c)}$, where a, b, c , are the lengths of the sides, and S is half their sum.

In the geometry of the sphere, a triangle is a figure bounded by three arcs of circles.

TRIANGLE OF FORCES, in mechanics, is the name given to a proposition which is merely a formal modification of the *parallelogram of forces* (q.v.), and, as generally stated, is its converse. The parallelogram of forces enunciates that, if two forces, P and Q (fig.)—represented in direction and magnitude by AB and AC —inclined at an angle to each other, act on a point A , their resultant, R , is represented in direction and magnitude by the diagonal, AD , of the parallelogram formed on the two lines AB and AC . Now, as the resultant, R , is equivalent to the combined action of P and Q , it would exactly counter-balance them if acting in the opposite direction AR' , but would still be fully represented by the diagonal line AD , taken as from D to A . Also, instead of AB, CD may be taken to represent P . Hence as the sides of the triangle ACD completely represent the three forces, we have the proposition, *that if three*



forces in the same plane be in equilibrium on a particle, and if in that plane any three mutually intersecting lines be drawn parallel to the directions of the forces, the lengths of the sides of the triangle thus formed will be proportional to the magnitudes of the forces. Its proof rests upon the previously ascertained fact that R', P , and Q , three equilibrating forces at A , are proportional to AD, CD, AC , and on the geometrical theorem that a triangle whose sides are respectively parallel to those of another triangle, has its sides proportional to those of the latter; and consequently, the ratio and relative direction of the forces R, P , and Q , are fully represented by ad, cd , and ac , the sides of the triangle *acd*. Again, as the sides of a triangle are to one another as the sines of the opposite angles, so also are the forces which the sides represent. Hence

$$P : Q : R :: CD : AC : AD :: \sin. CAD : \sin. ADC : \sin. ACD$$

(and substituting the sines of the supplementary angles)

$$:: \sin. QAR' : \sin. PAR' : \sin. PAQ;$$

that is, each force is proportional to the sine of the angle between the directions of the other two.

TRIANGULAR NUMBERS. See FIGURATE NUMBERS.

TRIANGULATION is the operation of dividing any portion of the earth's surface into triangles of as large a size as possible, which may be called primary, and which must be afterward subdivided into triangles of a smaller size, forming a great network of secondary or subsidiary triangles, which serve as a means of working down from great to less, and finally completing, by a system of scientific checks, an accurate map or delineation of the region covered by such triangles, forming the geodesical process called a trigonometrical survey. See **TRIGONOMETRICAL SURVEY**, **ORDNANCE SURVEY**. The same operation is used in the measurement of an arc of the meridian, for the purpose of ascertaining the length of a degree of latitude or longitude on any part of the earth's surface; but in this case, only primary triangles are necessary, as no topographical detail is required, and the positions of the apexes of the triangles are astronomically fixed in the most careful manner, which is not always done in the triangles of a trigonometrical survey.

In carrying out a system of triangulation, much judgment and an accurate local knowledge of a country are necessary; and it very often happens that a more extensive range of angles can be obtained from a comparatively low station than from the tops of the highest mountains. The angles of each triangle should be as near equal as possible, and, unless local circumstances render it unavoidable, very acute or obtuse angles should not be used. The sides of the primary triangles should be as long as can be conveniently observed, but in practice they vary from 80* m. or more to 4 m., or even less. The angles are generally determined by a large theodolite, of as simple and strong a construction as possible, which is fixed on the most elevated points of mountain ranges, etc. When the apexes of the triangles are very distant, heliostats, or mirrors reflecting the sun's rays, are often used, and in dark or cloudy weather the Drummond light has been employed. The primary triangles being fixed on the spherical surface of the earth, certain formulæ, according to the rules of spherical trigonometry, must be applied to reduce them to the simple calculations for ascertaining, from certain known data, the sides and angles of plain triangles. The whole of those calculations are dependent on the accurate measurement of a base or fundamental line. The instruments invented by capt. Drummond, R.E., with which he measured the base-line of the Irish survey at lough Foyle, and which were afterward employed by sir T. Maclear in verifying Lacaille's base-line on the plains of Malmesbury, in the Cape triangulation, appear to have been as nearly perfect as possible. The length of base-lines used in modern surveys varies from 3 to 7 m.; gen. Roy's original base-line of the English survey was 5.19 miles.

At the end of a large triangulation, a second or testing base-line is always measured at a distance from the original one; if the measured length of this agrees with that ascertained by calculation, it may be considered a proof of the accuracy of the work in general. In the survey of Great Britain by Mudge and Colby, bases of verification were measured for at least every 200 m., except in Scotland, where only one was measured near Aberdeen.

The triangles of the English survey have been extended to and connected with those of France, Russia, etc., as far e. as Siberia, and s. to Algiers; and it is not at all improbable that the triangles of the Russian survey will eventually be connected at one side with those of the great survey of India, which already has the apexes of many of its triangles on the summits of the Thibetan Himalaya, and to the eastward across Behring's strait, with those of British America and the United States. See Yolland's *Account of the Measurement of the Base of Lough Foyle* (Lond. Longmans, 1847); col. Portlock's *Life of Colby*; and art. "Celestial Measurements and Weighings," by sir John Herschel, *Good Words* (1864).

TRIAS, the oldest group of the secondary strata, formerly associated with the permian rocks under the name of the new red sandstone (q.v.). The term trias, or the triple group, has been given to these beds by German geologists because they are separable into three distinct formations: the Keuper, Muschelkalk, and Bunter-sandstein; and the name has been generally adopted, as the beds are more fully developed in Germany than in England or France. The German beds have consequently been accepted as the types of the group, and the deposits in Britain and elsewhere are co-related with them.

The typical beds are divided into—1. Keuper (q.v.), with a maximum thickness of 1000 ft.; 2. Muschelkalk (q.v.), with a maximum thickness of 600 ft.; 3. Bunter sandstein (q.v.), with a maximum thickness of 1500 feet.

In England the principal triassic deposit occurs in a great basin of the paleozoic strata in Lancashire, Cheshire, Shropshire, Staffordshire, and Leicestershire. The eastern base of the great central Pennine range of hills is composed of triassic beds, which, beginning in Leicestershire, run northward through Nottingham and York to the coast of Durham. From Staffordshire another series of these beds may be traced along the valley of the Severn, and crossing the Bristol channel, through Somerset and Devon, to the southern coast.

* In the survey of India, and also in the process of connecting the triangulation of Ireland with that of Great Britain, many of the sides of the triangles greatly exceeded this length.

TRIBE (Lat. *tribus*, a division, originally perhaps a third part, in reference to the three cantons whose coalescence formed the germ of Rome, q. v.), an aggregate of stocks—a stock being an aggregate of persons considered to be kindred—or an aggregate of families, forming a community usually under the government of a chief. The chief is possessed of despotic power over the members of the tribe. It is commonly said that he has “patriarchal” power—such power, that is, as fathers in early times exercised over their children. The tribe has been the earliest form of the community among all the races of men.

In a very large proportion of existing tribes the tribe is an aggregate of several stocks or distinct bodies of kindred. The persons of whom the tribe consists are included in stocks which are, or are accounted, distinct from each other. This organization is sustained by two tribal customs—(1) persons of the same stock are forbidden to intermarry; and (2) kinship is reckoned through females only, so that children are accounted of the stock of their mother. Persons of the same stock, too, owe duties to each other, and are to some extent sharers in each other's liabilities. Thus, an injury done by a man is an injury done by his stock, which may be avenged upon any member of it; an injury done to a man is an injury done to his stock, for which every member of it is bound to seek vengeance. In consequence of the customs above mentioned, a husband must be of a different stock from his wife or wives; he must therefore be accounted of a different stock from his children; and when he has wives of different stocks, their respective children are accounted of different stocks. More than one stock is thus represented in every household; and since a man owes duties to his stock—the duties of acknowledged blood-relationship—while to those of his family who are not of his stock, nothing but the accident of birth (only accident) unites him, the family among these tribes has necessarily little cohesion. The tribal customs which have been referred to ignore the family altogether; they are founded upon the idea of stock. They are the customs of people with whom the conception of stock was a powerful social influence, when that of the family was impotent—of people who must have been divided into stocks at a time when, possibly, they had no family system. It is inconceivable that such customs should have arisen in the face of a family system anything like that which prevails among civilized peoples, or even of such an approach to the family as many of those tribes now possess. And it follows that the family has *grown* among these tribes. It is obviously now growing among them. Now, in many cases, the only obstacle to its rapid development is the firm hold which the idea of stock has taken of the tribal life. On the other hand, the prevalence of customs founded upon the idea of stock proves a prior existence of stocks, or bodies of kindred. The separation into stocks must be older than the customs, at least as customs associated with the idea of stock. And keeping this in view, and considering how difficult it is to conceive of several stocks herding together at the early time when every stranger was an enemy, unless there was some natural connection between them—such a connection as the marriage-law and the system of kinship, when they arose, would establish—it may safely be concluded that each stock was originally a separate tribe. Into the tribe conceived of as a single stock the marriage-law and system of kinship would gradually bring a variety of neighboring stocks; and thus the tribe would become what it is—an aggregate of stocks. The progress of such tribes appears to have been from the tribe conceived of as a group of kindred to the tribe consisting of several stocks or groups of kindred; and now, though the family is not yet fully developed among them, they seem to be tending to become aggregates of families. The tribes of Australasia are the most perfect examples of the organization above described; but it also exists (or it existed) among the tribes of North, and most of those of South America, among a majority of the known tribes of Africa, and a large proportion of the ruler tribes of Asia.

Suppose male kinship (which must come with the growth of the family) introduced among tribes such as have been spoken of, containing different stocks. First, the stocks existing within the tribe would be fixed, stereotyped, within it; secondly, the growth of the family would be greatly promoted, and the influence of the idea of stock proportionately diminished. The family would in time rise to the importance originally possessed by the stock; and at length the tribe, still divided into stocks, would become, politically, an aggregate of families. The tribe would thus assume the exact shape which it had in the early ages of Greece and Italy, when it was an aggregate of families included in clans or bodies considered kindred (*gentes*); the exact shape which it now has among the most advanced of existing tribes. Since a tribe of the Australian type might thus develop into a tribe of the classical type, is it not probable that the latter really was the result of such a process of development? Regarded as a hypothesis, this view will be found to fulfill all the conditions of a good hypothesis. And if the circumstances of tribes which have what is popularly termed the marriage law of caste—among the greatest of which a division corresponding to the Roman *gens* prevails—can be reconciled with it, or with an extension of it, we shall have got a hypothesis capable of explaining the formation of tribes in general. The tribes above referred to, whether divided into clans or not, consider themselves of a common stock. They restrict marriage to the stock; but they always forbid marriage within certain degrees of relationship; and in numerous cases—among them, those of the most numerous caste peoples—they also forbid marriage within the clan or body considered peculiarly kindred. It will be convenient, for want of a

better word, to speak of this marriage law as caste. And by caste tribes, in what follows, are to be understood tribes which have this marriage law.

Seeing that the law forbidding marriage within the tribe, and the law restricting marriage to the tribe have both been widely prevalent among human races, both must be conventional, produced by circumstances; and if in their origin they are equally ancient, men, at the first, in respect of their circumstances, must long have been divided into two bodies very differently placed. This, however, is very improbable. There is no evidence for it; there is some evidence against it. The circumstances, too, capable of producing caste must have been isolating circumstances. The effect of an isolated position in producing an approach to caste may be seen in the case of the royal houses of Europe. Excepting, perhaps, mere physical isolation, it is difficult to conceive of isolating circumstances which could operate in the earliest times. Those which can be conceived of, and which are also known to have operated among caste peoples—the pride of conquerors, peculiarities of religion, the sentiment of an aristocracy or a priesthood, hereditary occupations—could only exist when society is somewhat advanced. It thus becomes highly probable that caste did not prevail in the earliest times—was not the original law of any tribes. There is strong corroboration of this in the fact, that it is found imperfectly established—in the course of being established—among not a few existing tribes; and in the fact, that it became the law of peoples—for example, the Hebrews—whose ancestors, according to tradition, followed a different practice. In connection with these considerations, there is conclusive reason for holding that caste was not an original law, in the law of incest which prevails among the greatest of caste peoples, by which marriage is forbidden, not only within certain degrees of relationship, but also within the clan or body of kindred denoted by a family name. The existence of any law of incest among a caste people requires explanation. But how could a prohibition of marriage within the clan arise among people, whose principle it was to marry within the kindred? This can only be referred to circumstances which preceded the origin of caste. Does it not, then, suggest the establishment, through the force of isolating circumstances, of caste—the restriction of marriage to the tribe, or to particular tribes—among tribes divided into stocks which had forbidden marriage within the stock? This would, at any rate, account for the facts. The original prohibition, upon this view, is still represented by the prohibition of marriage within the clan. But as tribes advanced, the family usurped the place of the stock; there sprung up a belief in the common origin of the tribe; and the law of succession to family property gave a new importance to near relationships. The law of incest would naturally tend to follow the practically important limits of relationships: and it might, being still applicable to the stock, be held specially binding within those limits; or it might be confined to them, for in the case of small and simply-constituted bodies, within which the differences of condition and of employment were few and slight, the stocks—pressed, on the one hand, by the growth of the family, on the other, by the growing belief in the common descent of the tribe—would be apt to disappear altogether. The absence of the stock or clan in the case of some of the smaller caste tribes, and the two laws of incest found among caste peoples—one of which, at least, seems otherwise inexplicable—can thus be accounted for consistently with the hypothesis of such peoples having progressed from the organization of the Australian tribe. And it having been shown that caste is not an original law, all other circumstances of caste tribes will be found consistent with that hypothesis. The belief which many tribes have had in their descent from one progenitor, is not corroborated in any case. It cannot prove its own truth. In many cases it can be shown to be a fiction; it is presumably so in all cases, and it does not afford an argument for or against any theory of the origin of tribes.

The hypothesis of development, as it may be called, is thus capable of connecting together all the varieties of the tribe, the simplest with the most advanced; and it gives us, as the earliest and simplest idea formed of the tribe, that it was a body of persons who conceived themselves to be of a common stock. It is in the favor of this hypothesis that it affords an easy and natural explanation of the peaceable political union and fusion into one people of neighboring tribes; and of the fact, that a population is divided into a greater or less number of tribes, according as it is less or more advanced. Neighboring tribes would contain the same stocks; they would thus be really homogeneous, and related; they would be ready for union as soon as their circumstances brought them into close contact, and made a political union desirable.

There are facts and arguments by which this hypothesis may be raised to so high a degree of probability, that its soundness can scarcely be doubted. A single example of them must suffice. It is the received opinion that among the advanced tribes containing gentes, property was originally vested in the gens, and was only by slow degrees wrested from it by the family. It is involved in this, that at one time the gens was everything, the family nothing, in the organization of the tribe; that the latter grew, and that as it grew, the former sunk in importance. The tribe, when property was exclusively vested in its gentes, must have been an aggregate of gentes, not an aggregate of families. All this is consistent with, and corroboratory of the hypothesis of development; in particular, it strongly corroborates the view that the tribe at an early period consisted of several bodies of kindred, accounted distinct from each other, and

each of which held property in common. It has never been accounted for upon any other view.

The only other theory which has been formed of the origin of tribes—commonly called the patriarchal theory—is that a tribe consists in the main of the descendants of a single family, descent being chiefly, if not exclusively, reckoned through males; and that the gentes found within the tribe consist of the descendants of individual sons or grandsons of the common progenitor. It is evident that this theory does not explain the organization of the numerous class of tribes first considered. It has been formed upon observation of the advanced tribes of the classical type, but it does not consist with the history of property (to test it at a single, but a vital point) even among them. It might account for property being vested in the tribe; it does not account for it being vested in the gentes. It can only do so by the aid of the assumption that, though the sons and grandsons of the original progenitor had the desire for family property, and divided his property, or accumulated property of their own, their descendants suddenly lost that desire, and began to hold in common. But such a supposition is too improbable to be entertained. This theory is also excluded in the case of all polyandrous peoples, for it assumes that society began with monandric marriage, a perfect idea of the family and male kinship—all conditions the very opposite of those which must at one time have prevailed among such peoples. And polyandry can be shown to have prevailed so widely, that it is probable it has been the earliest practice of every human tribe. However this may be, a theory which is contradicted by a great proportion—much the greatest number—of the cases to be accounted for, and is in important respects not consistent with any class of cases, cannot be a good hypothesis; and therefore the patriarchal theory has no title to be accepted as explaining the normal history of the formation of tribes, or of any class of tribes. Its fundamental assumption, indeed—the segregation of individuals who became progenitors of tribes—seems to be at variance with the nature of man, which all experience has shown to be social and gregarious, and to be the most averse to separate and independent action, when society is the least advanced. It should also be stated that it fails to do what a sound theory of tribal formation must do—to account for the fusion of neighboring tribes, independently of conquest, into one people. To account for this, it has been customary to suppose that neighboring tribes, wishing to unite, adopted one another; but there is no evidence of such adoption having ever been practiced, and the supposition seems entirely improbable.

The patriarchal theory was, until recently, the received account of the formation of tribes. The theory which has here been styled the hypothesis of development was first propounded, though without elaboration, in a work published in 1865, *Primitive Marriage*, by J. F. McLennan.

TRIBONIANUS, a very eminent Roman jurist of the 6th c., of Macedonian parentage, but b. in Pamphylia. He held, under the emperor Justinian, the offices of quaestor, master of the imperial household, and consul. But he is famous chiefly through his labors in connection with the code (q.v.) of Justinian (q.v.) and the pandects (q.v.). Tribonianus died in 545.

TRIBUNE. See **ROME**.

TRICHECUS. See **MORSE**.

TRICHI'ASIS (Gr. *thrux*, gen. *trichos*, of a hair) consists in a growing inward of the eyelashes; three or four of them (sometimes only one) presenting their points toward the globe of the eye, while all the other hairs retain their natural position. The disease is exceedingly common among the lower classes, and especially the Irish. This affection causes great annoyance, by exciting a pricking sensation, and by the constantly irritable and watery state of the eye which it induces. The treatment consists in plucking out the offending hairs (if they are few in number) from time to time, each hair being removed by hair-forceps with a slow steady pull. If they form a little group, they must be removed by dissecting out the small portion of lid in which they are implanted, and uniting the wound with a suture. In other cases, it may be necessary to remove the entire margin of the lid.

TRICHINA SPIRA'LIS, the name given to a peculiar nematoid worm, which, in its sexually immature state, inhabits the muscles usually of the pig. It was discovered in 1835, Mr. Wormald, then demonstrator of anatomy at St. Bartholomew's, giving to prof. Owen four microscopical specimens of speckled muscle from a subject that was then in the dissecting-rooms; and Mr. Paget, then a first year's student, simultaneously investigated the question. Prof. Owen, to whom the discovery of the trichina is generally referred, soon afterward communicated to the zoological society his "Description of a Microscopic Entozoon infesting the Muscles of the Human Body," in which he describes the speckles as capsules containing a spirally-coiled microscopic worm, to which he gave the generic name trichina (Gr. *thrux*, a hair), and the specific name *spiralis*, from its coiled arrangement. Mr. Paget had independently arrived at similar results, with the aid of Robert Brown of the British museum, and read a paper on the subject to the Abernethian society a week before prof. Owen's memoir was read to the zoological society: so that his name should always be at least associated with that of Owen, in reference to

the discovery of this worm. From the date of this discovery to the present time, the *trichina* has been a fertile source of discussion. In 1845 the idea was mooted by various naturalists that the trichina was the undeveloped or sexless form of some other worm; and in 1855 (after the transformation of the cysticercus into the tapeworm was discovered), various suggestions were made on this subject; but it was not till 1860 that Virchow and Leuckart, by feeding animals on flesh containing trichinae, arrived independently at the correct conclusion, that the parents of the encysted trichinae are small nematoid worms, which had never previously been described, Leuckart's experiments being made with human flesh containing these parasites.

The young trichinae, as they are seen in the human muscles, present the form of spirally-coiled worms, in the interior of small, globular, oval, or lemon-shaped cysts, which appear as minute specks scarcely visible to the naked eye. These cysts are more or less covered externally with calcareous matter, according to the length of time they have remained in a fixed position, and the degree of degeneration which their walls have undergone. The trichina measures, according to Cobbold, on an average $\frac{1}{3}$ of an in. in length, and $\frac{1}{150}$ of an in. in breadth. The cysts are sometimes altogether absent, and hence they must be regarded as abnormal formations, resulting from local inflammation set up by the presence of the worm, which in this larval condition of existence measures $\frac{1}{25}$ of an in. in length, and $\frac{1}{500}$ of an in. in breadth. These larval worms exhibit a well-marked digestive apparatus, and afford evidence of the presence of reproductive organs, which are often sufficiently developed to enable the observer to determine the sex of the organism. The number of larval trichinae that may simultaneously exist in the muscles of a single man or animal is enormous. In a cat on which Leuckart experimented, a single ounce of flesh was estimated to contain 325,000 trichinae; and if all the voluntary muscles of a human body of ordinary size were similarly affected, the number of worms would exceed 1950 millions!. Dr. Cobbold believes that there can be no doubt that the number in a single "bearer" (as he terms the sufferer) may *actually* amount to at least 20,000,000.

We now proceed to the consideration of the mature worms. When an animal is fed with flesh containing the larval worm already described and is killed a few days afterward, a large number of minute worms are found mixed with the contents of the small intestines. On closer examination, they are found to be of two kinds—the larger and more numerous ones being the females, and the smaller and rarer ones the males. At the second day after their introduction, these intestinal trichinae attain their full sexual maturity; and in six days the females contain perfectly developed and free embryos in their interior.

The female is a slender round worm, varying in length from $\frac{1}{3}$ to $\frac{1}{2}$ of an inch. The anterior end presents a bead-like appearance, from which the intestinal canal proceeds. The posterior three-fourths are mainly occupied by the reproductive organ, which is filled partly with free embryos, and partly with eggs in various stages of maturity. When these embryos have attained their full size within the uterus of the parent, they pass out at the genital aperture, and commence life on their own account. They are little worms with rounded ends, and presenting no indications of any internal organs. Before entering into the history of their migrations, we may mention that the male worm is seldom more than two-thirds the length of the female. It presents the same bead-like arrangements as the female, and a reproductive organ whose aperture apparently coincides with the anus; while the female sexual aperture is comparatively near the head-end of the worm. The body terminates with two hooks which are doubtless subsidiary to the reproductive process. The males are less numerous and shorter lived than the females, and probably die after having discharged their natural function. The females continue bringing forth young for a period of two or three weeks. The embryos, according to Leuckart, Cobbold, and all our best helminthologists, penetrate the walls of the intestine, and pass directly into the muscles of their "bearers" or "hosts," where, if the conditions are otherwise favorable, they are developed into the form originally observed by Owen and Paget. In this way, by proceeding along the course of the intermuscular connective tissue, some of them reach the muscles of the extremities and other distant parts; but the majority of the wandering embryos (according to Virchow) "remain in those sheathed muscular groups which are nearest to the cavity of the body (abdomen and thorax), especially in those which are smaller and most supplied with connective tissue." These embryos penetrate into the interior of the separate muscular bundles, and in the course of 14 days acquire the size and organization of *trichina spiralis*. The surrounding tissues soon become disorganized, and the spot inhabited by the coiled-up worm is converted into a spindle-shaped widening, within which the previously described cyst is formed by a hardening and calcification of the exterior. A point of great importance in relation to the distribution of this parasite, and as having a practical bearing upon the disease known as *trichiniasis* (q.v.), has been established by the experiments of Davaine—viz., that while in the adult condition, trichinae perish in cold water in about an hour, and cannot survive the decease of their host for more than six hours, the larvæ remain alive in water for a month, and will live for a long time in flesh which has become putrid. In this way, "a carcass near a marsh or rivulet may communicate the parasites to the ruminants that drink the water, or to pigs."

In the same year (1860) in which Virchow and Leuckart proved that by feeding an

animal on flesh containing the *trichina spiralis*, intestinal trichinae were produced, and watched the transformation of the young of the latter into muscular trichinae, a very important corroborative medical case was observed and recorded by Zenker. In this case the patient was a servant-girl, aged 20, and the principal symptoms were loss of appetite, prostration, violent pains, and contraction of the limbs; and finally oedema, which, with a certain amount of pneumonia, terminated fatally in the course of a month. After death, numerous larval trichinae were found in her muscles, while the intestinal canal contained sexually mature worms. Three weeks previously, before the girl had taken ill, she had assisted in killing pigs and making sausages. It was further ascertained that a few days before her illness commenced she had eaten some of the meat in a raw state. On examination it was found that the pork (both hams and sausages) contained numerous encysted trichinae. It was, moreover, ascertained that the butcher and several members of the girl's family (to whom she had probably given sausages) were attacked with symptoms similar to those which, in her case, proved fatal. How the pig acquires its trichinae is unknown; but that the larval trichinae contained in putrid flesh, etc., may easily gain admittance to the pig's alimentary tract is a supposition at once feasible and of likely kind. Beet-root, earth-worms, moles, and rats have been suggested as their infectors; but on this subject see the advice given by the French commissioners in the next article. The adult trichina is liable to infest the intestinal canal of all animals in which the larvae have been found in the muscles. In this category must be placed man, the dog, cat, rabbit, rat, mouse, mole, hedge-hog, and badger. Whether birds ever contain trichinae is doubtful, and reptiles and fishes are quite free from this parasite.

TRICHINIASIS is the name of the diseased condition which is induced by the ingestion of food containing *trichina spiralis* in large quantity. The first recorded case, as occurring in the human subject, is that of Zenker, which has been already noticed in the article **TRICHINA**; but there can be no doubt that the disease has long existed, although its origin was previously unsuspected. The first symptoms of this disease, as it occurs in the human subject, are loss of appetite, followed by nausea and a sense of fatigue, prostration, and general indisposition. This stage lasts about a week. Pain and stiffness of the limbs, accompanied by swelling of the face, and fever of a peculiar type, characterized by a very frequent pulse, moderate thirst, and copious perspirations, now show themselves; the commencement of the second stage of the disease being thus synchronous with the migration of the trichina-brood into the muscles, there to become encysted. During this stage, pressure, or any attempt to move the parts under the control of the swollen muscles, is intensely painful, and even the normal respiratory movements cause such constant pain as to render sleep impossible. In severe cases the patient lies on his back like a paralyzed person. The tongue presents much the same appearance as in ordinary gastric fever. The bowels are most commonly constipated, but in some of the worst cases there is continuous diarrhea. The swelling which began in the face now disappears, and is replaced by swelling of the feet, which gradually rises to the trunk. In about the fourth week of the disease the trichinae may be regarded as permanently settled, and as having completed their destructive action on the muscles. This is the beginning of the third stage, which is mainly characterized by extreme weakness. The gastric symptoms abate, the appetite returns, and, in favorable cases, the muscular pains and swelling gradually diminish, while in severe cases, this third stage is the most dangerous part of the disease; the diarrhea being severe, and accompanied with tenesmus, and often with the involuntary discharges of the feces and urine, while the skin exhibits extreme pallor, and is enormously distended with effused serum. Moreover, pneumonia often supervenes at this period. The fourth and last stage is that of convalescence. This may begin at the fifth week, or later, and may last from 3 weeks to as many months. In mild cases it is impossible to draw a definite line between this and the preceding stage. Death may occur at any period. It has been observed as early as the 5th, and as late as the 42d day of the disease. A single trichinous pig, if its flesh is eaten without being previously submitted to such culinary processes as to destroy the vitality of the larval trichina, may establish a local epidemic of this disease. The most important of those epidemics have occurred in Germany, and are noticed by a German physician, Dr. Thudichum, in "The Seventh Report of the Medical Officer of the Privy Council," 1865. Of these, the second or great epidemic at Hettstädt was the most severe. It commenced in the second half of Oct., 1863, and affected 158 persons, of whom 28 died. All these persons were found to have been eating trichinous pork, either perfectly raw, or in the form of smoked or fried sausage, meat-balls, brawn, black-pudding, etc.

As soon as a case of suspected trichiniasis comes under the notice of the physician, attempts should be made to remove the mature worms from the intestine by active purgation. For this purpose calomel, in scruple doses, is more serviceable than any other purgative. Two or three such doses should be given at intervals of 24 hours. No special directions can be given for the treatment of the fever. If there is any appetite, the diet should be light, and at the same time nourishing. Liebig's extract of meat has been found very serviceable in keeping up the strength. The most effectual remedy for the sleeplessness was found to be the cold wet sheet, in which the patient should be wrapped

repeatedly during the day. The preparations of opium only aggravate the discomfort. The other symptoms must be treated by the ordinary rules of therapeutics.

Considering the gravity of this disease, it would be of the greatest importance to be able to decide, during its life, whether a pig were trichinous or not. On this point there is some difference of opinion; but profs. Delpech and Reynal, who were charged by the French government to report upon this disease, assert that "the animal, while living, shows no signs of the presence of trichinæ, nor can they be detected in the meat with an ordinary lens, but a powerful microscope renders them at once visible." In Hanover, out of 25,000 pigs, 11 were found trichinous; in Brunswick 16 were affected out of 14,000, while in Blakenburg 4 were diseased out of 700. The French commissioners assert that a temperature of 167° Fahr. is sufficient to kill the parasites, and that meat thoroughly salted is also perfectly safe; they advise that smoke-dried sausages, though probably safe, should be well boiled. They further attribute the spread of the disease among pigs to the fact that they are foul feeders, and will eat any offal, such as the dead bodies of rats and other animals, which are known to be liable to the disease. They recommend farmers to be very cautious in feeding their pigs to avoid giving them flesh without first boiling it; to destroy rats and small carnivorous animals, and never to leave human or other excrements in places where pigs can reach them. Finally, they advise all experimenters to burn trichinous flesh when their investigation is completed, and not to throw it away, for a fragment of it might possibly be eaten by a rat, the rat devoured by a pig, and the pig thus become the medium of the disease to man. This utter destruction of the parasites is a point on which our countryman, Dr. Cobbold, has long insisted. In 1863 a trichinous pig from Valparaíso, killed on board a merchant-vessel on the high seas, caused the death of two of the crew; and in 1864 there was a slight trichinous epidemic at Cheektowaga, New York. Probably trichina-disease is a common ailment in this and other countries; its symptoms, save in very severe cases, attracting no special notice, from their similarity to those of rheumatic disease and acute febrile attacks. The disease has been known to occur in the n.w. of England in a mild form; but helminthology, and the detection of parasites of all kinds, requires still much cultivation at the hands of the medical profession. In 1835 Mr. Wood, of Bristol, published, in the *Medical Gazette*, a case of acute rheumatism accompanied by pneumonia, in which trichinæ were discovered after death; thus *all but* anticipating Zenker in discovering a new disease.

TRICHINOPOLY (more correctly TRICHINAPALLI), the capital of a collectorate of British India of the same name with an area of 3,515 sq.m., on the right bank of the Kaveri, 80 m. w. of Tanjur. The fort, which includes the old town, stands on the rugged slope of a steep granite rock, 500 ft. in height, which from some points resembles Edinburgh castle. The walls of the fort, which are now demolished, had a circuit of 2 m., and this area is inhabited by a dense population, dwelling in low, closely-packed huts. The streets are tolerably regular, and are crowded at all hours of the day with multitudes of passengers, bullock-carts, and cattle. Beyond the walls is St. John's church, containing the tomb of bishop Heber, who was buried here in 1826. The climate during eight months of the year is exceedingly hot, nevertheless Trichinopoly is the head-quarters of the south division of the Madras army; there are several barracks, and the lines for the men and the officers' houses cover a space of ground 6 m. in circumference. Cheroots are manufactured in large quantity, from excellent tobacco grown in the vicinity. Manufactures of hardware, cutlery, and jewelry, especially gold chains, harness, and saddlery, are extensively carried on. A railroad to Madras was opened in 1873. Pop. in '71, 76,580. Pop. of district, '71, 1,200,408.

TRICHIURIDÆ, a family of acanthopterous fishes, related to the mackerels, but distinguished by their elongated form and imperfectly developed anal fin. The slender tail is sometimes filiform, but generally is terminated by a caudal fin; skin naked; head compressed, eyes lateral; mouth with deep lateral cleft; teeth in jaws and palate; branchial apertures large; branchiostegal rays in seven or eight pairs; dorsal fin long, generally single, but often divided into two parts; anal fin represented by numerous concealed spines; caudal fin forked or wanting; pectorals well developed; ventral fins rudimentary; vertebrae numerous. There are only a few genera, inhabiting deep seas, one of which is *lepidopus*. See SCABBARO FISH.

TRICHOCEPHALUS (derived from the Gr. *thrix*, gen. *trichos*, a hair, and *cephale*, the head), is the name given to a genus of intestinal worms, of which one species *T. dispar* (described by the older writers, who mistook its head for its tail, as *trichurus* and *ascaris trichūra*), infests the human intestinal canal. Dr. Cobbold describes it as a small nematoid worm, the male measuring $1\frac{1}{2}$ in., and the female fully 2 in. in length; it is characterized by an extremely long hair-like head and neck, occupying about two-thirds of the entire length of the body. This parasite is comparatively rare in this country, while, according to M. Davaine, not less than one-half the inhabitants of Paris are infested by it. Its presence is attended with little or no inconvenience. Its development and mode of gaining access into the body are subjects to which much attention has recently been paid, but which are by no means as yet cleared up. Davaine finds that the eggs are not developed within the host's intestines, but are discharged *per anum*, in the immature condition in which they escape from the parent; and it further appears, that after their expul-

sion, a period of six months must elapse before embryonic formation commences. As in the more common instance of *ascaris lumbricoides*, it is probable that they complete their development in open water, from which they are transferred to the human stomach.

For further information on the genus *trichocephalus* generally, we may refer the reader to Part I., chap. v. of Dr. Cobbold's *Entozoa*; while the species considered in this article is fully discussed in Davaine's *Traité des Entozoaires*.

TRICHOP TERA. See CADDICE.

TRICK, a term used in heraldry to denote a mode of representing arms by sketching them in outline, and appending letters to express the tinctures, and sometimes numerals to indicate the repetition of changes.

TRICLINIUM, the apartment in a Roman house in which the meals were eaten.

TRICOLOR means literally no more than a flag in three colors, which is the case of almost every national ensign; but the applied sense limits it to flags having three colors in equal masses. The principal European tricolor ensigns are: France—blue, white, red, divided vertically. German empire—black, white, red, divided horizontally. Italy—green, white, red, divided vertically. Belgium—black, yellow, red, divided vertically. Holland—red, white, blue, divided horizontally. The tricolor took its rise at the commencement of the French revolution as the badge of the national guard. The red and blue were selected as the arms of Paris, and the white was added, as the color of the army, to show the intimate union which should subsist between the people and the armed force.

TRICOUPIS, SPIRIDION, a modern Greek statesman and author, son of a prime of Missoloughi, was born in that town in 1791. After completing his studies in France and England, he went to the Ionian isles, where he aided lord Guilford in the foundation of the university of Corfu (1820); but on the outbreak of the war of independence in the following year, he hastened to enroll himself among the patriots, and played an important part in the great struggle. From 1821, except during the presidency of Capo d'Istria, he was continually employed in administrative and diplomatic business. During the reign of king Otho, he was thrice sent to London (1835-38, 1841-43, and 1850-55) as envoy-extraordinary; he was minister of foreign affairs and of public instruction (1843); vice president of the senate (1844-49); and envoy-extraordinary to Paris (1850) on the occasion of the blockade of the ports of Greece by England. In the grave political vicissitudes he had his share, and in 1862 declined to form a ministry on account of ill health. He died in 1873.

Tricoupis enjoyed a great reputation in his own country as an orator and historian. His funeral oration on lord Byron (whose friend and comrade he had been), delivered in the cathedral of Missoloughi, some days after the poet's death, has been translated into most European languages. Many other orations, partly religious and partly political, spoken by Tricoupis in the course of the revolution, have been collected and published (Paris, 1836). Besides these, we must mention a martial poem on the Klephts (*Poëma Klephtikon*, Par. 1820); but his masterpiece is his history of the Greek revolution (*Historia tes Hellenikēs Epanastaseos*, Lond. 1853-54), a work which is praised for its accuracy, impartiality, and style.

TRIDACNIDÆ, a family of lamellibranchiate mollusks, having the shell open, the valves equal, the foot small, and furnished with a byssus. *Hippopus maculatus*, the bear's-paw clam (q.v.), is prized for its beauty. *Tridacna gigas* is remarkable for its great size, exceeding that of any other bivalve. The shell of a single specimen has been known to weigh more than 500 lbs. The valves are sometimes used in Roman Catholic churches for holy-water vessels. They are also used as an ornament for grottoes and fountains. They are deeply furrowed and beautifully grooved. This great mollusk is a native of the East Indies, and is found in shallow water. It is used for food, and one suffices for a number of persons.

TRIDENT, in classic mythology, is used as the symbol of Neptune's sovereignty over the sea. It consisted of a staff, armed at one end with three short prongs, with double barbs at the points, resembling the *fuscina* used by the Italians in catching large fish, particularly the sword-fish, from which we may perhaps infer that Neptune was originally the god of fishermen. It was customary among the Grecian states to place the figures of their patron deities, or their appropriate symbols, on coins; hence, we frequently meet with the trident on ancient coins, such as those of Saguntum, etc.; likewise on the Sicilian coins of Hiero, etc.

TRIDENTINE PROFESSION. See TRENT, COUNCIL OF, *ante*.

TRIEN NIAL PRESCRIPTION, in the law of Scotland, is a limit of three years imposed on all creditors to bring their actions to recover a certain class of debts and

damages—such as actions to recover merchants' accounts, servants' wages, house-rents (where the lease is verbal), debts due to tradesmen, lawyers, and doctors. So actions to recover damages for wrongous imprisonment must be brought within three years.

TRIEST, or **TRIESTÉ** (Slav. *Térsť*), the most important sea-port of the Austrian monarchy, and the most considerable trading town on the Adriatic, stands at the head of the gulf of Triest, an arm of the gulf of Venice, 90 m. s.w. of Laibach, on the Vienna and Triest railway. It is an imperial free town, and attached and belonging to it is a territory 46 sq.m. in extent, consisting of the slopes of the *Triestiner Kúrst*, which decline somewhat abruptly toward the Adriatic shore. The city of Triest, in which the population of the district is almost wholly massed, the other places being only small villages, consists of the old town, the new town, or Theresienstadt, and the two suburbs, Josefstadt and Franzenstadt. The old town, built on the slope of a steep hill, surmounted by a castle, forms about a fourth of the whole city, and is distinguished by its narrow streets and black walls. It contains the cathedral, an early Byzantine edifice of uncertain date, into the walls of which stones bearing Roman inscriptions and carving have been built, and the tower of which is said to rest on the foundation of a temple of Jupiter. The new town, with broad streets built in regular parallelograms and handsome houses, occupies the plain that fronts the sea. Between these two divisions runs the *Corso*, the chief thoroughfare of the city. The *Tergesteum*, in the new town, is a splendid modern edifice, built in 1842, and containing a bazaar, a grand concert and ball room, exchange and reading rooms, and the offices of the Austrian Lloyd's, the largest establishment in Europe for sea steamers. To the n., on the sea-shore, is the new and magnificent lazaretto, with a harbor in which 60 vessels can perform quarantine at once. There are numerous churches for Greeks, Jews, Roman Catholics, and Protestants. The population includes Germans, Americans, Italians, Greeks, Jews, Armenians, Dalmatians, etc.; but Italian is the prevailing language. Triest is a free port; and the harbor, the entrance to which is uninterrupted by islands or sandbanks, is well protected. The manufactures carried on here are very extensive. There are upward of 40 establishments for ship-building, 3 great soap-works, and 7 rope-works. Rosoglio, white lead, and leather are manufactured, and wax-bleaching is carried on. About 12,500 vessels, with a tonnage of 1,000,000, enter and clear the port annually. The value of the imports is about £14,000,000; that of exports, £10,000,000. Pop. in '69, 70,274; of the city with the surrounding district of Triest, about 125,000.

Triest, the ancient *Tergeste* or *Tergestum*, was of importance under the Romans, and first receives historical mention 51 B.C., when it was overrun and plundered by neighboring tribes. It was much improved by Augustus; and, in 1382, finally passed into the hands of Austria. It owes its prosperity chiefly to the emperor Charles VI., who constituted it a free port, and to Maria Theresa. Since the year 1816, Triest has borne the title of "the most loyal of towns."

TRIFLE, a supper dish at evening entertainments. It consists of two parts. The lower is usually made of sponge-cakes, ratafias, or macaroons, soaked in sherry or Madeira, and placed in the bottom of a proper glass-dish; over these is then poured a mixture of fine boiled custard and of cream, in equal parts; and sometimes another layer of the cakes is laid, well soaked in sherry. A whip, or syllabub, is then made with sugar, cream, white of egg, and sometimes a little white wine and brandy, the froth of which, as it is formed by the whisk, is removed, and placed over the soaked cakes, and forms the second part of light froth of the trifle. Almost every cook has some variation in the manufacture of this dish.

TRIFOLIUM. See CLOVER.

TRIFORIUM, the arcade over the arches of a church between the central and side aisles. It is usually a dark gallery, being the wall-space against which the lean-to roof of the aisles rests. In the later styles, the side aisles were covered with independent roofs, so as to allow the triforium arches to be filled with glass.

TRIGG, a co. in w. Kentucky, drained by the Cumberland and Tennessee rivers, the latter its n. boundary; about 500 sq.m.; pop. '80, 14,489—14,441 of American birth, 4,040 colored. The surface is hilly, and in great part covered by forests. The valleys are fertile and produce corn, wheat, tobacco, and pork. Iron ore is found. Co. seat, Cadiz.

TRIGGER. See LOCK.

TRIG'LA. See GURNARD.

TRIGLYPH, the ornament in the frieze of the Doric style (q.v.). It is supposed to represent the ends of the beams in the original wooden temples. It is always divided into channels or flutes, with guttæ or drops below.

TRIGONIA, a genus of mollusca, represented at the present day by only three species, natives of Australia, but remarkably abundant in the secondary rocks. Upward of 100 species have been described from strata between the trias and the chalk inclusive,

but not a single species is known from any tertiary deposit. The shell is trigonal (whence the name), thick, and tuberculated, or ornamented with radiating or concentric ribs. The interior is nacreous. The external ligament is small and prominent, and the huge teeth are large, diverging, and transversely striated. The animal has a long, pointed, and powerful foot, with which it is able to make considerable leaps. The gills are ample, and united behind the body to each other and to the mantle.

TRIGONOCARPON, a common fruit in the coal-measures, occurring in all the strata except the underclays and limestones. Some six or eight species have been established, which differ from each other in size and shape—some being as small as a pea, and others as large as a walnut. They are marked, when preserved in the round, with three longitudinal ridges, and from this character the name was derived. They have never been found attached to any plant. From their shape, and their occurring in such quantities in some localities that they might be gathered by the bushel, it was at first thought that they were palm-fruits; but Dr. Hooker, from the examination of several specimens which exhibit structure, has shown that they are not unlike the structure of *salisburia*, a drupe-bearing coniferous tree, a native of China and Japan. He found that they were composed of four distinct integuments, and a large internal cavity filled with carbonate of lime, but which, he supposed, originally contained the albumen and embryo. The determination of the affinities of this fruit is the more important, as the existence of conifers in the coal-measures was known from the occurrence in them of disk-bearing woody tissues; and the absence of linear leaves and cones makes it the more likely that they belonged to the drupe-bearing division of the order. It is probable that the trunk, to which the generic name *dadoxylon* has been given, and the casts of the large pith of which is known as *sternbergia*, had for its leaves the fern-like fossils named *noggerathia flabellata*, and *trigonocarpus* for its fruit. Dr. Dawson has, however, recently referred some *trigonocarpa* to *sigillaria*, and he considers the anomalous organism called *antholites* to be the bud-form of the fruit. He has never found them in contact with *sigillaria*, and it is much more probable that this was a cryptogamous tree, and consequently had spores, and not seeds, for its fruit.

TRIGONOCEPHALUS, a genus of extremely venomous serpents, of the family *crotalidae*, nearly allied to rattlesnakes, but having the tail terminated with a spine instead of a rattle. The head is covered with plates or shields; the dorsal scales are keeled. *T. rhodostoma* may be mentioned as an example. It is found in Java, and preys chiefly on frogs. *Cenchris*, *erasedocephalus*, and other genera have recently been separated from *trigonocephalus*. The moccasin snake of the southern states of North America belongs to the genus *cenchris*. One of the most dangerous serpents of the West Indies is *erasedocephalus lanceolatus*.

TRIGONOMETRICAL SURVEY. Trigonometrical surveying is that higher branch of measurement of the earth's surface in which the use of angular instruments, such as the theodolite, altitude, and azimuth instrument or sextant, is indispensable in forming the network of triangles, on the accuracy of which the correctness of the survey depends. In the article **TRIANGULATION**, the necessary operations have been briefly adverted to, and in **ORDNANCE SURVEY** will be found a sketch of the history of the principal modern trigonometrical surveys executed, or now being made.

In the *Aide Mémoire of Military Sciences*, conducted by officers of the corps of royal engineers, a very full and complete article will be found on this subject; and the government blue-books, from time to time issued on the surveys both of this country and India, afford much valuable information on the internal economy and arrangements necessary for carrying on such vast works.

When it is necessary to fix the astronomical position of the stations, of course, the transit, zenith sector, and other instruments used in the observatory, must be transferred to situations very often difficult of access, exposed to strong winds, etc., which adds much to the difficulty of getting correct observations. Meteorological and magnetic observations are often taken simultaneously with the astronomical; and, indeed, are now considered as nearly indispensable in modern operations. See **SURVEYING**, **TRIANGULATION**, etc.

TRIGONOMETRY (Gr. *trigōnon*, a triangle, *metria*, measurement), the measurement of triangles. This definition, though expressing correctly enough the scope of trigonometry in its early stages, is now wholly inapplicable, as trigonometry, like geometry, has far exceeded its primitive limits; and though the original name is, for convenience, retained, the science may be more properly defined as the "consideration of alternating or periodic magnitude." Trigonometry, within the limits of its earlier definition, is geometrical; its advance beyond these limits is due to the introduction of purely algebraic methods. The quantities with which geometrical trigonometry has to deal are certain lines definitely placed with respect to an angle, and consequently varying with it. These lines, generally denominated *trigonometrical functions* of the angle, are the sine, cosine, tangent, cotangent, secant, and cosecant, and are represented in the accompanying figure. The angle BAC is placed at the center of a circle, called the circle of reference; its *sine*,

CD, is the perpendicular let fall from the extremity of one radius upon the other; the *cosine*, DA, is that part of the radius between the foot of the sine and the center; the *tangent*, BE, is drawn at right angles to one radius to meet the other produced; the *secant*, AE, is the radius produced to meet the extremity of the tangent; the *cotangent*, FG, is drawn from the extremity of a radius at right angles to one of the former, to meet the other produced; and the *cosecant*, AG, is the radius produced to meet the extremity of the cotangent. Other functions, as the *versed sine*, DB, which is the distance from B to the foot of the sine, and its counterpart, the *coverversed sine*, FH, have been occasionally introduced and defined, but they are of no practical use. EAF, the angle which must be added to BAC to make up a right angle, is called the *complement* of BAC; and CAL, the defect of BAC from two right angles, is called its *supplement*; and by inspection of the figure we can see at once that the sine of BAC, CD, is equal to AH, the cosine of its complement; that the cosine of BAC, AD, is equal to CH, the sine of its complement; and that generally any function of an angle is the co-function of its complement, and *vice versa*; also, that CD, the sine of CAB, is also the sine of its supplement; AD, the cosine of CAB, is the cosine of its supplement; and that generally the function of an angle is the function of its supplement. If a right angle be added to BAC, then we have the triangles ADC, ABE, shifted so as to be situated in the same relative position to AF as they now are to AB, and each line is consequently at right angles to its former position; hence the sign of BAC is the cosine of $(90^\circ + \text{BAC})$, and similarly of the others. By an extension of this process of investigation we arrive at the general conclusions that if an angle be added to or taken from one or an odd number of right angles, the function of the original angle is the co-function of the one so derived; and that if an angle be added to or taken from an even number of right angles, the functions of the original angle are the functions of the derived one. But since a function of an angle is the same function of its supplement, a knowledge of the function would not enable us to determine to which of the two angles it belonged, unless we possessed some knowledge of more than the mere magnitude of the function. This desideratum is supplied in the following manner: B is taken as the zero-point of reckoning, the radius BA, which is thus supposed to be fixed, is one of the bounding lines of every angle, the other side being supposed to move in the direction BFL, as the angle increases. Let the radius AC be supposed to sweep round the circle in a left-hand direction (viz., toward F), then, as it approaches F, the sine CD increases, till, on reaching F, the sine coincides with the radius; passing F, and moving toward L, the sine diminishes, till, on reaching L, it becomes zero. Continuing its progress round the circle, the angle BAC becomes *re-entrant* (viz., greater than two right angles); and its sine again increases, becoming equal to the radius at M, and diminishing in the fourth quadrant till it becomes zero at B. While the angle increased from B to L, the sine was drawn *downward*; for the other half of the revolution, it was drawn *upward*; hence, in the first and second quadrants, the sine is said to be *positive*, and in the third and fourth, *negative*, the position of a function in the first quadrant being adopted as the standard. The following table shows the variation (increase or decrease, and between what limits, as well as the sign affecting it) of each of the functions as the angle increases:

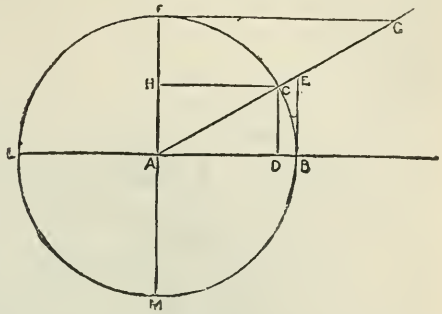


FIG. 1.

Angle.	Sine.	Cosine.	Tangent.	Secant.	Cotangent.	Cosecant.
0° to 90°	inc. 0 - R, +	dec. R - 0, +	inc. 0 - ∞, +	inc. R - ∞, +	dec. ∞ - 0, +	dec. ∞ - R, +
90° " 180°	dec. R - 0, +	inc. 0 - R, -	dec. ∞ - 0, -	dec. ∞ - R, -	inc. 0 - ∞, -	inc. R - ∞, +
180° " 270°	inc. 0 - R, -	dec. R - 0, -	inc. 0 - ∞, -	inc. R - ∞, -	dec. ∞ - 0, +	dec. ∞ - R, -
270° " 360°	dec. R - 0, -	inc. 0 - R, +	dec. ∞ - 0, -	dec. ∞ - R, +	inc. 0 - ∞, -	inc. R - ∞, -

We here observe that all the functions increase and decrease alternately as the angle of which they are the functions passes from one quadrant to another; also that the sine and cosecant are affected by the same signs, as also are the cosine and secant, and tangent and cotangent.

Again, from fig. 1, we obtain, from the properties of right-angled and of similar triangles, the following relations between the functions: $\text{Sin.}^2 + \text{cos.}^2 = R^2$, $\text{tan.}^2 + 1 = \text{sec.}^2$, $\text{cot.}^2 + 1 = \text{cosec.}^2$, $\text{tan.} : R :: \text{sin.} : \text{cos.}$, $\text{sec.} : R :: R : \text{cos.}$, $\text{cot.} : R :: \text{cos.} : \text{sin.}$, $\text{cosec.} : R :: R : \text{sin.}$, and $\text{cot.} : R :: R : \text{tan.}$. From these eight relations we can easily obtain any one function in terms of any other, both as regards its magnitude and sign.

The reason why the circle and its radius are employed in the definition of the functions is that we may obtain some invariable standard by which to estimate them, for

while, as the angle increases from 0° to 360° , its functions are in a state of constant change, their standard of reference, the radius, remains the same. For greater simplification the radius is taken as unity, and the relations become $\sin.^2 + \cos.^2 = 1$, $\tan.^2 + 1 = \sec.^2$, $\cot.^2 + 1 = \csc.^2$, and (by the reduction from the proportional to the divisional form of the other five relations) $\tan. = \frac{\sin.}{\cos.}$, $\sec. = \frac{1}{\cos.}$, $\cot. = \frac{\cos.}{\sin.}$, $\csc. = \frac{1}{\sin.}$, $\tan. =$

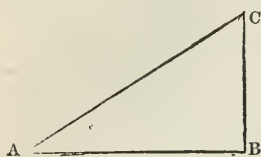


FIG. 2.

$\frac{1}{\cot.}$; the various functions being expressed in terms of the assumed unit. Thus, in the right-angled triangle ABC (fig. 2), if AC be radius, BC = sin., and AB = cos., of the angle A; but if the radius be assumed as unity, $\sin. A = \frac{BC}{AC}$, $\cos. A = \frac{AB}{AC}$, and similarly from the above relations, $\tan. = \frac{BC}{AB}$, $\sec. = \frac{AC}{AB}$,

$\cot. = \frac{AB}{BC}$, and $\csc. = \frac{AC}{BC}$; and in algebraic trigonometry these latter are the definitions of the trigonometrical functions.

The only angular functions which geometry enables us to determine with accuracy are those belonging to the angles of an equilateral triangle (Euc. I. 1), an isosceles right-angled triangle (Euc. II. 9), and an isosceles triangle which has each of the angles at its base double of the third angle (i.e., base angles each 72° , vertical angle, 36°) (Euc. IV. 10); and from these, by means of a proposition (demonstrated in all text books on the subject) which determines the functions of the angle (A + B) from a knowledge of the functions of A and of those of B; and also, as a corollary to the preceding, the functions of $2A$, $4A$, $8A$, etc., and inversely of $\frac{1}{2}A$, $\frac{1}{4}A$, etc., from a knowledge of those of the angle A, have been obtained and tabulated the functions of all angles from $1'$ to 45° , the functions of angles from 45° to 360° being, as is evident from the above remarks respecting complementary and supplementary angles, merely repetitions of these.

The relations between the angles and sides of a triangle are three in number, and are obtained from simple geometric considerations; they are —(1) $AB : AC :: \sin. C : \sin. B$; (2) $\cos. B = \frac{AB^2 + BC^2 - AC^2}{2AB \cdot BC}$; (3) $AB + AC : AB - AC :: \tan. \frac{1}{2}(B + C) : \tan. \frac{1}{2}(B - C)$.

From these relations in conjunction with the fact that the three angles of a triangle collectively amount to 180° , it is possible, having given any three (one being always a side) of the six elements (three sides and three angles) of a triangle, to determine the other three. It is this that constitutes trigonometry in its primitive and elementary form. If the triangles be right-angled, only the first relation and the property of the sides of a right-angled triangle, are necessary for the complete solution. Further information on this subject will be found in any text-book.

Algebraic trigonometry is one of the most important branches of analysis, but it is too extensive and varied to be even sketched here; suffice it to say, that in it the trigonometrical functions are not considered as geometrical magnitudes, but as numerical quantities having certain relations to each other, and that the circle as well as the angular functions are treated as multiples or sub-multiples of the radius. Many important results, such as the approximate estimation of the circumference of a circle, the completion of the solution of cubic equations, etc., have been obtained by its means; and a thorough knowledge of its modes and results is absolutely necessary to an acquaintance with higher mathematics.

Spherical trigonometry is plane trigonometry applied to spherical triangles. See any text-book.

TRIKHALA, or **TRIKALA**, a t. of European Turkey, 33 m. w.s.w. of Larissa. It is built on the slope of a hill, manufactures cotton and woolen stuffs, and has a large transit-trade with Epirus and Albania. The neighboring plains which are watered by the Salembria (anc. *Peneus*), are rich in all sorts of fruits. Pop. about 10,000. Trikhala is the *Trikka* of Homer, and was celebrated in the classic ages for its temple of *Æsculapius*.

TRILLIA'CEÆ, a small natural order of plants, belonging to the class dietyogens (q.v.) of Lindley. They are herbaceous plants, with tubers or root-stocks, whorled leaves, hermaphrodite flowers; perianth of six leaves, the three inner leaves sometimes colored: six, eight, or ten stamens, the filaments extending beyond the anthers in awl-shaped points; the ovary free, 3 to 5-celled, with numerous ovules; the fruit succulent. The order is characterized by narcotic properties. The genus *paris* (q.v.) belongs to it.

TRILLIUM, a genus of herbaceous perennial plants of North America, of the lily family; embracing about a dozen species, growing in moist and shady (not marshy) grounds from Maine to Florida. They have a naked stem, 10 to 15 in. high, terminated by three ovate, pointed, broad, beautifully netted-veined leaves. The *T. grandiflorum*, or wake-robin, is one of our most beautiful wild flowers, growing in rich woods (preferably alluvial) from Vermont to Kentucky, Wisconsin, and northward. The

flowers, which appear in June, at first nearly white, but changing with age to rose-color, are borne on a peduncle from 2 to 3 in. long.

TRILLOBITES, an order of fossil crustacea entirely confined to the paleozoic rocks. They are specially abundant in the Silurian period, and disappear in the lower members of the coal-measures.

The body was covered with a chitinous shield, which consisted of a large united cephalic shield, a variable number of body segments, and a tail or pygidium, composed of a number of joints, more or less ankylosed. The eyes were sessile and compound. The lenses are frequently beautifully preserved, and in some species are so large that they can easily be seen with the naked eye. In *asaphus caudatus*, each eye had at least 400 facets; and in the large *A. tyrannus*, it is estimated that there no fewer than 6,000. In some species, a bifurcated plate has been found in the region of the mouth, which is believed to be a labrum, but no antennæ or limbs have been yet detected in any specimen. They may have been entirely destitute of antennæ, as in some living animals to which they are nearly related these organs are very rudimentary; and their feet were probably soft and leaf-like appendages, bearing the gills, which would speedily perish, and leave no traces in a fossil condition. The sexes are believed to be indicated by variations in the length of the cephalic and caudal spines, and in the prominence of the head lobes. The members of the order varied greatly in size, some species being scarcely larger than a pin's head, while others, like *asaphus gigas*, attained a length of 18 inches. It is probable that many named species may be only larval or transition forms of others. The minute *agnosteus* is frequently found in such quantities as to indicate that it lived in shoals, as if it were the larval form of some large trilobite. Burmeister considers that trilobites have their nearest allies in the minute phyllopora, a section of entomostracous crustacea, which live in stagnant water, and are never at rest, but continually swimming at various depths on their backs, some being so near the surface of the water that their feet touch it. He consequently supposes, that trilobites lived gregariously in shallow water close to shore, moved only by swimming near the surface, and could not creep at the bottom; that they swam in an inverted position, with the belly upward; that they made use of their power of rolling themselves into a ball as a defense against attacks from above; and that they lived on smaller water-animals.

Above 400 species have been described, and grouped into 50 genera. Of these, 46 are Silurian, 22 Devonian, and 4 carboniferous.

TRILOGY, the name given by the Greeks to a group of three tragedies, either connected by a common subject, or each representing a distinct story. A satyric drama was customarily added as a termination, whence the whole was sometimes termed a *tetralogy*. Every tragic poet that wished to take part in a poetic contest had to produce a trilogy along with a satyric drama at the Dionysiac, Lenæan, and Anthesteriac festivals. We possess only one perfect specimen of the classic trilogy—the *Oresteia* of Æschylus, which embraces the *Agamemnon*, the *Chaphora*, and the *Eumenides*.—See Welcher, *Die Æschy-lische Trilogie* (Darmst. 1824); Franz, *Des Æschylos Oresteia* (Leip. 1846).

TRIMBLE, a co. in n. Kentucky, separated from Indiana by the Ohio river; about 150 sq.m.; pop. 80,717—7,112 of American birth, 577 colored. The surface is uneven and heavily wooded; tobacco, wheat, corn, and pork are the staples. Co. seat, Bedford.

TRIMETHYLAMINE, or TRIMETHYLIA (C_3H_9N , or $3C_2H_5N$), is a very remarkable organic base, with an extremely powerful and disagreeably fishy odor. It is obtained as a colorless gas, readily soluble in water, and having a strong alkaline reaction. With acids, it readily forms soluble salts. It occurs in large quantity in the pickle in which herrings (especially their roes) have been lying, and in the spirit in which old anatomical preparations have been long suspended; and (strange as it may appear) it imparts to the leaves of *chenopodium olidum* their atrocious odor, and to the flowers of *cratægus oxyacantha* (the common hawthorn) their agreeable fragrance. It is obtained by distillation from ergot of rye, from guano, the juice of the leaves of red beet-root, and from putrid yeast, and has been detected in small quantity in human urine and in the blood of the calf. It may be formed artificially by the action of iodide of methyl on dimethylamine; but the source from which it may most readily be derived is herring-brine.

TRIMMER, a political term in use in the reigns of Charles II. and William III., originally applied to certain politicians of Charles's time, of whom the chief was Charles Montagu, earl of Halifax, who held opinions half-way between the extreme whigs and tories. Halifax adopted the name trimmer as a title of honor, maintaining that everything good was a medium between extremes.—The same term was applied more generally by Dryden and other writers of the same period to all who, professing to be friends to monarchy, were at the same time enemies to the duke of York, and who were equally obnoxious to the court and to the fanatical republicans.

TRIMMER, Mrs. SARAH, was b. at Ipswich on Jan. 6, 1741. Her father was a Mr. Joshua Kirby, a man of intelligence and piety, who removed to London about 14 years after, and became tutor to the prince of Wales, afterward George III., in the science of perspective, a subject in connection with which he was favorably known by several

ingenious works. Among other distinguished persons with whom his daughter had now the advantage of meeting, was the great Dr. Johnson, with whom she speedily became a favorite. In 1759 her father was appointed clerk of the works at Kew palace, whither he went to reside; and here miss Kirby became acquainted with Mr. Trimmer, to whom, in 1762, she was married. It was not till the year 1780 that she came before the world as an authoress, by the publication of her *Easy Introduction to the Knowledge of Nature*, intended for the use of young people. The success of this little work encouraged her to further efforts in the same field; and during the next few years, she issued in succession six volumes of *Sacred History, Selected from the Scriptures, with Annotations and Reflections Adapted to the Comprehension of Young Persons*. Her next work was the *Economy of Charity*, addressed to benevolent people of her own sex, which went through several editions. She edited subsequently in succession *The Family Magazine*, and the *Guardian of Education*; a selection of her contributions to the first of which was issued under the title of *Instructive Tales*: her chief papers to the other being collected in the volume published after her death as *An Essay upon Christian Education*. Besides this, she labored assiduously in the preparation of school-books for the society for promoting Christian knowledge, intended to supersede the imperfect manuals then in use; and did much miscellaneous work of a somewhat cognate kind. She died quite suddenly on Dec. 15, 1810. Her works for the young, though now for the most part superseded, were excellently adapted for their purpose, and for a long time had an extensive popularity. Her *History of the Robins* is still a favorite.

TRIMŪRTI (from the Sanskrit *tri*, three, and *mūrti*, form), is the name of the Hindu triad, or the gods *Brahman* (masculine), *Vishn'u*, and *S'iva*, when thought of as an inseparable unity, though three in form. The *Padma-Purāṇ'a* (see **PURĀṆ'A**), which, being a *Purāṇ'a* of the *Vaiṣṇ'ava* sect, assigns to *Vishn'u* the highest rank in the *Tri-mūrti*, defines its character in the following manner: "In the beginning of creation, the great *Vishn'u*, desirous of creating the whole world, became three-fold: creator, preserver, and destroyer. In order to create this world, the supreme spirit produced from the right side of his body himself as *Brahman*; then, in order to preserve the world, he produced from the left side of his body *Vishn'u*; and in order to destroy the world, he produced from the middle of his body the eternal *S'iva*. Some worship *Brahman*, others *Vishn'u*, others *S'iva*; but *Vishn'u*, one, yet three-fold, creates, preserves, and destroys; therefore, let the pious make no difference between the three." And the *Matsya-Purāṇ'a*, where speaking of *Mahat*, or the intellectual principle of the *Sāṅkhya* philosophy (see **SĀṆKHYA**), says that "Mahat becomes distinctly known as three gods, through the influence of the three qualities, goodness, passion, and sin; being one person and three gods—viz., *Brahman*, *Vishn'u*, and *S'iva*." Apart, therefore, from sectarian belief, which makes its own god the highest, and gives him the attributes also of the other gods, *Trimūrti* implies the unity of the three principles of creation, preservation, and destruction, and as such belongs more to the philosophical than to the popular belief. When represented, the *Trimūrti* is one body with three heads: in the middle, that of *Brahman*; at its right, that of *Vishn'u*; and at its left, that of *S'iva*. The symbol of the *Trimūrti* is the mystical syllable *om*, where (*o* being equivalent to $a + u$) *a* means *Brahman*; *u*, *Vishn'u*; and *m*, *S'iva*. See **OM**.

TRINCOMALEE', a sea-port t. and magnificent harbor on the n.e. coast of Ceylon, in 8° 34' n., and 81° 12' east. The town is built on a bold peninsula, which divides the inner and outward harbors. It is a place of great antiquity, but its ancient renown was due more to religious than political or geographical considerations, for it was here that the Malabar invaders of Ceylon built one of their most sacred shrines—the "Temple of a Thousand Columns," to which pilgrims flocked from all parts of India. This celebrated shrine was demolished by the Portuguese, who fortified the heights with the materials derived from its destruction, 1622 A.D. It was next held by the Dutch; but in 1672, during the rupture between Louis XIV. and the United Provinces, the French took Trincomalee, which was abandoned by the Dutch in a panic. In 1782 the French admiral, in the absence of the British commander, took possession of the fort, and the English garrison retired to Madras. It was restored to the Dutch the following year, and they retained it until the capture of Ceylon by the British in 1795. The modern town is in no way remarkable, and, with the exception of the official buildings, makes a poor appearance. There are Hindu temples in barbarous taste, and religious festivals and processions to which a similar epithet may be applied. The bay of Trincomalee is land-locked, and presents a scene of tranquil beauty; its fine expanse of water is still as an inland lake, and equally sheltered. "On comparing this magnificent bay," says sir J. E. Tennent, "with the open and unsheltered roadstead of Colombo, and the dangerous and incommodious harbor of Galle, it excites an emotion of surprise and regret that any other than Trincomalee should have been selected as the seat of government and the commercial capital of Ceylon. As a harbor, Trincomalee is renowned for its extent and security; but its peculiar superiority over every other in the Indian seas consists in its perfect accessibility to every description of craft in every variation of weather." The mean temperature for the year at Trincomalee is 81°.4. Pop. about 15,000.

TRINCOMALEE WOOD. See **HALAMILLE**.

TRING, a t. of Hertfordshire, Eng., 32 m. n.w. from London, near the right bank of the Ouzel, a branch of the Ouse. It is a neatly built town; has manufactures of silk, canvas, and straw-plait, and is a station on the London and North-western railway. The Grand Junction canal passes not far from it. Pop. '71, 4,045.

TRINGA. See SANDPIPER.

TRINIDAD, an island belonging to Great Britain, and the most southerly of the West India islands, being in lat. 11° north. It is about 50 m. long, varying in breadth from 30 to 35 m., and the area amounts to 1755 sq. miles. It is separated from the mainland (Venezuela) by the gulf of Paria, and the extreme points on the w. coast are only 13 and 9 m. respectively from it. The Dragon's Mouth entrance, to the n., is the deepest channel to the harbor; and the southern, or Serpent's Mouth, is shallow, owing to the deposits brought down by the Orinoco. The gulf itself is shoaling up from the same cause. The aspect of the island of Trinidad is different from that of the Caribbean islands generally: the mountains are not so lofty, and they extend in an e. and w. direction along the northern coast, clothed with stately forests, and their margins fringed with overhanging mangroves, dipping into the sea. From the double-peaked mountain called Tamana, are seen the lovely and fertile valleys and plains with which the other part of the island abounds. The island has several good harbors, and some tolerably large rivers.

The chief town, Port of Spain, is one of the finest towns in the West Indies. It was originally built of wood, but was burned down in 1808, and the town has since been rebuilt of the good stone procured in the neighborhood. The streets are long, wide, well paved, clean, and shaded with trees. There is another town called San Fernando, with two or three pretty villages.

A remarkable phenomenon is a pitch lake near the village of La Brea, composed of bituminous matter floating on the surface of fresh water, about 3 m. in circumference, and 80 ft. above the sea. The mineralogy of the island is but little known. The soil is very rich and productive. The climate is hot and moist; the thermometer ranges from 75° to 85° , sometimes 90° ; and the rain-fall is about 75 inches.

The most important products are cocoa, sugar, rum, molasses, coffee, cotton, arrow-root, cocoa-nut, oil, hides, etc. The value of the exports in '75 was £1,625,082; imports, £1,507,794. The pop. of the island in '71 was 109,638, being an increase of 25,200 over that shown by the census of '61; occasioned principally by the voluntary immigration from the neighboring colonies and from India. Trinidad is a crown colony, ruled by a governor, an executive council of 3, and a legislative council of 13 members. Various Christian denominations are represented in Trinidad. The first railroad in Trinidad, extending from Port of Spain to Arima, a distance of 16 m., was opened for traffic in '76.

Trinidad was first discovered by Columbus in 1498, and thus named by him because three mountain summits were first seen from the mast-head when discovered; but no permanent establishment was founded there until 1532 by the Spaniards. In 1783, it first fell into the hands of the British, who were confirmed in possession of it in 1802.

TRINITY, a river of California, rising near the coast-range, and flowing through a country of rich gold mines into the Klameth river.

TRINITY, a river of Texas, U.S., formed by the union of two streams, West Fork and Elm Fork, which rise near the northern boundary of the state, and unite 150 m. s.e., the main stream flowing thence 550 m. in the same general direction to Galveston bay, about 40 m. n. of the city of Galveston. It is navigable 300 to 500 miles.

TRINITY, DOCTRINE OF THE, is the highest and most mysterious doctrine of the Christian religion. It declares that there are three persons in the Godhead, or divine nature—the Father, the Son, and the Holy Ghost, and that "these three are one true, eternal God, the same in substance, equal in power and glory—although distinguished by their personal properties." The most elaborate statement of the doctrine is to be found in the Athanasian creed, which asserts that "the Catholic faith is this: That we worship one God as Trinity, and Trinity in Unity—neither confounding the persons nor dividing the substance—for there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, and of the Son, and of the Holy Ghost is all one; the glory equal; the majesty co-eternal."

It is admitted that the doctrine is not found in its fully-developed form in the Scriptures; but it is supposed to be clearly revealed in its elements in the New Testament, and also to be indicated in many of the statements and revelations of the Old Testament. The form of expression in speaking of God in the Old Testament Scriptures—the plural *Elohim*, coupled with a singular verb; the apparent distinction recognized in the revelations to the patriarchs and Moses between Jehovah and "the angel of Jehovah;" the mode in which "the Spirit" and "word" of God, and "wisdom" (Proverbs viii.) are spoken of; and the gradual unfolding of the doctrine of a "Messiah," are all supposed to be indications from the earliest times of the truth of a plurality of persons in the Godhead; and in the New Testament Scriptures the doctrine is represented as clearly taught in the Trinitarian formula of baptism—the general character of the claims and prerogatives of Jesus Christ, especially

the ascription to Him of the designation "the Son of God," and in the functions attributed to the Holy Spirit. The evidence is held conclusive of the equal divine nature and yet distinct personality of the Son and the Spirit along with God the Father. It is generally conceded, however, that the Christians of the 2d, and even of the 3d c., were far from having a clearly understood and recognized doctrine on this high subject. They were content for the most part to use Scriptural expressions in speaking of the Father, and the Son, and the Spirit, without defining articulately their relation to one another. It was not till the progress of opposing heresies sought, on the one hand, to degrade the divine dignity of Christ (Ebionitism in its various forms, and Arianism); or, on the other hand, to confound the personality of Christ with God the Father—a heresy known in its special form as Patripassianism—that the church was led to define in the Nicene creed the relation of the Son to the Father; and further, in the Nicæno-Constantinopolitan creed, the relation of the Spirit to the Father. This creed was specially directed against the opinions of Arius. A further clause was afterward added, known as the *filioque* clause, which determined the procession of the Spirit from the Son as well as the Father; but this clause, and the doctrine which it embodies, was never accepted by the eastern church, to whose finer speculative genius is owing the determination of the controversies which began in the 3d c., regarding the divine nature. The western or Latin church had a far less refined genius for such speculations; and in so far as it meddled with them, has imparted to them a coarser and more contradictory aspect. What is known as the "Athanasian creed," which is now well understood to be of Latin, and not of Greek origin, is a sufficient illustration of this.

It is not our part here to criticise the evidence for the doctrine of the Trinity, or the validity of the doctrine itself; it is enough to say that the evidence which we have briefly sketched in outline, has been accepted as satisfactory, not only by the Roman Catholic and oriental communions, but also by all the great Protestant communions. The only exception in modern times to the reception of the doctrine is in the case of the Socinians or Unitarians, who occupy in their teaching very much the position of the ancient Humanitarians (Ebionites). They reject the doctrine of the Trinity as incredible, and regard Christ merely as a higher prophet. There have, however, been various thinkers within the Christian church, such as Dr. Samuel Clarke in the beginning of last century, who, while accepting generally the doctrine of the Trinity, have rejected the special terms in which it is defined in the creeds, and whose views have been known as semi-Arianism.

TRINITY, DOCTRINE OF THE (*ante*), as a *doctrine* has reference only to the fact as revealed; while *theories* respecting it are attempts to state the mode, which is unrevealed and unknown. A man may have faith in the doctrine without attempting to form any theory concerning it; his faith may rest on evidence appropriate and sufficient for the *fact*, while his theory may appear to other minds irrational or inconsistent with faith; his faith may be steadfast, while his theoretical views may change with his years, studies, and associations with other minds. Prof. Edwards A. Park writes thus, in *Bibliotheca Sacra*, April, 1881: "A theologian may adopt the following definition of the Trinity: The Father is God; the Son is God; the Holy Spirit is God; the three are distinct from each other by a necessity of their very substance; neither is God without the others; and there is only one God. Here is the doctrine, stated without using technical terms. A theory of the doctrine is, that God is only one person in the psychological sense of that word, but exists in three distinct modes—ontological and necessary modes of subsistence, and not modes of mere action or manifestation. The first of these modes is the ground on which it is distinctively proper for him to perform one class of official acts; the second is the ground on which it is distinctively proper for him to perform another class of official acts; the third is the ground on which it is distinctively proper for him to perform a still different class. As each mode is distinct from the other two, each is called a *distinction*. As each is the ontological basis of a distinct property, each is called a *subsistence*, an *hypostasis*. As each is the ontological basis on which personal acts ultimately depend, each is called a *person* in a technical, not in the philosophical sense of the word. As each of these modes is relative to the other two, each is called an *internal relation*. God is said to exist in the three modes, distinctions, persons, relations; and the three are said to exist in him; and the three are said to *be*, as well as to *be in*, the one God. On this theory the different *ὑποστάσεις* have only one consciousness, one will, one set of attributes; the unity being plain, the triality being mysterious. A different theory is that the three divine Persons have each a distinct consciousness, a distinct will, a distinct set of attributes; the unity being mysterious and the triality plain. A modification of this theory is that the Godhead consists of three minds, each one of which has a consciousness of the other two, and is thus one with them. A not uncommon theory is that the infinite mind differentiates itself from itself, and then unites itself with itself; the subject projecting itself into an object of consciousness is the first Hypostasis; the object being known by the subject is the second Hypostasis; the knowledge identifying the object with the subject, or the love uniting the two, is the third Hypostasis. This general proposition in diversified forms lies at the basis of theories which do not exhibit it on the surface. In the earlier period of his life Melancthon said: 'These mysteries (the doctrines of God, the Trinity, the person of Christ) are better revered than

inquired into.' At a later period he defined the Trinity as 'the eternal necessary process of the divine self-consciousness, in which God, whose thoughts are realities, eternally sets himself over against himself, but also again unites with himself.'"

TRINITY, a co. in n.w. California, drained by Trinity and Mad rivers; traversed by the Coast range of mountains in the e.; about 1850 sq.m.; pop. '80, 4,998—2,307 of American birth. The surface is mountainous and little cultivated. Gold is found in large quantities. Co. seat, Weaverville.

TRINITY, a co. in e. Texas, drained by the Trinity and Neches rivers—its n.e. and s.w. boundaries; about 950 sq.m.; pop. '80, 4,915—4,905 of American birth, 1158 colored. The surface is level, heavily wooded, and fertile; cotton, cattle, corn, and pork are the staples. Co. seat, Trinity.

TRINITY COLLEGE, Cambridge, was founded by king Henry VIII., in 1546, upon the site, and partly out of the revenues of several more ancient foundations. The names of these were King's hall, Michael house, Fyswicke's hostel, Hovinge inn, Gregory's, Margaret's, Catherine's, Gerard's, and Tyler's hostels. Of these, the first two deserve special mention. King's hall (*Aula regis*) was so called after its founder, Edward III., whose father, Edward II., had maintained 32 scholars, called king's scholars, but had died before completing his intentions. The hall was founded in 1337. The master's stipend was 4*l.*, and that of each scholar 2*d.* per day, with two robes at Christmas. The revenues of King's hall at the time of its surrender to Henry VIII. amounted to £214 per annum.

Michael house was founded 1324 A.D. by Hervey D. Stanton, who was chancellor of the exchequer to Edward II. He dedicated his college to the Trinity, the Virgin Mary, St. Michael the archangel, and All Saints. When Henry VIII. united these smaller foundations into the one great college, henceforth called TRINITY COLLEGE, besides other endowments, he added the estates of 27 dissolved monasteries, which made up the gross revenues to about £1700 per annum. Queen Mary added very largely to these benefactions, and provided for 20 additional scholars, 13 poor scholars or sizars, 4 chaplains, and a choir. Queen Elizabeth gave to the college a new set of statutes, by which the college was governed until the reign of queen Victoria, when these statutes were revised. Subsequently, under the Cambridge university commission (1859-60), new statutes have again been given, by which several important changes have been introduced. Such fellows as fill the office of bursar, tutor, or lecturer in the college, or professor in the university, are exempt from the necessity of taking holy orders, which must otherwise be done by all fellows within seven years of taking the degree of master of arts. Marriage also is permitted to fellows in a few exceptional cases, and to the chaplains and librarian. The master of the college must be in holy orders, and the appointment is in the gift of the crown. The following are some of the more eminent names in the list of masters: John Whitgift, who was raised to the see of Worcester; Thomas Nevile, dean of Canterbury, who built the greater part of the cloistered court known by his name; he died 1615. To Dr. Barrow, who was made master in 1672, the college owes the finishing of Nevile's court, and the erection of the library, for which the designs were furnished by sir Christopher Wren. The famous Dr. Bentley was master from 1700 to 1742. The late William Whewell was one of the most distinguished men that this college has produced, and one of the best of its masters. He was a munificent benefactor to the college, to which he added one new court during his life; and at his death bequeathed his large fortune to the building of another, and to the founding of a professorship of international law. See WHEWELL. To these may be appended the following few names of popular interest, with the dates of their death: lord Bacon, 1626; sir Edward Coke, 1634; Cowley, the poet, 1667; lord William Russell, executed 1683; John Dryden, 1701; Samuel Pepys, the diarist, 1703; sir ISAAC NEWTON, 1727; Richard Porson, 1808; lord Macaulay, 1859. Of living men, it will not be invidious to select only the names of Alfred Tennyson, the laureate, and prof. H. A. J. Munro, editor of *Lucretius*.

The foundation now consists of a master, 60 fellows, and 74 scholars. The present master is the rev. William Hepworth Thompson, D.D.

With the exception of the hall and the library, the college buildings are not of any architectural pretensions. The statue of Newton by Roubiliac, in the ante-chapel, is one of the finest modern statues.—See Cooper's *Annals and Memorials of Cambridge*; Dyer's *History*; and the *University Calendar*. The judges when on circuit have the right of being entertained at this college.

TRINITY COLLEGE, Oxford. In 1290 Richard de Hoton, prior of Durham, founded Durham college, at Oxford, for the education of the student-monks of Durham. At the dissolution of the monasteries, the property of this institution was transferred by Henry VIII. to the newly erected chapter of Durham cathedral. Its site and buildings, however, passed into the hands of sir Thomas Pope, who, in 1554, obtained a license from Philip and Mary to found a college on the spot, to be called Trinity college, for the maintenance of 20 scholars, of whom 12 were to be fellows, and 8 scholars, properly so called. The scholars were to be elected from the founder's manors, and the fellows from the scholars. In 1557 sir Thomas Pope added four scholarships; and about the same time another was added by a Mr. Blount. There are also two exhibitions. By the ordinances issued by the commissioners under 17 and 18 Vict. c. 81, the fellowships and

scholarships are thrown open without restrictions; the latter are tenable for 20 terms, value £80 a year, besides rooms. This is the first college, after Balliol, which was founded by a layman, as were all colleges subsequent to this date. It is also remarkable as having been, like St. John's, founded by a Roman Catholic after the reformation. It presents to 11 benefices.

TRINITY COLLEGE, Hartford, Conn.; under the control of the Protestant Episcopal church; founded, 1824, under the name of Washington college, which it bore until 1845. In 1872 the college grounds were sold as a site for the new state capitol, for the sum of \$600,000, and the college was removed to another location, where an imposing building for its uses has been erected. It is 1050 ft. in length and 376 ft. in width. It is in the form of a quadrangle, inclosing three courts, and covering or inclosing an area of four acres. It has a noble tower and spire 240 ft. high. The college has property estimated at more than \$1,000,000. The course of instruction does not vary essentially from that of other institutions of the first rank. Students wishing to do so may take special courses of a scientific character. It has (1878) 15 instructors and 109 students. The alumni number about 1100. J. R. Pynchon, D.D., LL.D., president.

TRINITY HALL, Cambridge. This college, which is distinct from Trinity college, was founded 1349-50 A.D. for scholars of canon and civil law, as well as for the education of clergy, by William Bateman, bishop of Norwich, who was also co-founder of Gonville and Caius college. It appears that the bishop was induced to found the college in consequence of the great pestilence which had recently swept away most of the clergy of his diocese, so that there could not be found sufficient to supply the parochial cures. In a bull of pope Clement VI., dated at Avignon, 1349, it is stated that there were at that time no less than 1000 parishes in the diocese void of incumbents. The first master was Robert de Stratton. There are thirteen fellowships, of which ten may be held by laymen for ten years, and are not vacated by marriage. There are also five law studentships, sixteen scholarships, and two exhibitions.—See Cooper's *Memorials and Annals*, and Dyer's *History of Cambridge*; also the *University Calendar*.

TRINITY HOUSE (properly called, The Corporation of the Elder Brethren of the Holy and Undivided Trinity), a corporation intrusted with the regulation and management of the light-houses and buoys of the shores and rivers of England. In 1518 a society under the above name was founded at Deptford by sir Thomas Spert, knight, and incorporated by Henry VIII. Its privileges were confirmed in 1538; and in 1680 its first light-house was erected; all the light-houses which had previously existed on the English coast having been built by private individuals under patents from the crown. By 6 and 7 Will. IV. c. 79, and the merchant shipping act, 1854 (17 and 18 Vict. c. 104), private rights in light-dues were abolished, and the exclusive right of lighting and buoying the coast committed to the board of Trinity house. The power of Trinity house to appoint and license pilots for the English coast is also regulated by this last-named statute. The Cinque ports pilots, who had formerly been under control of a separate society, were, by 16 and 17 Vict. c. 129, and the merchant shipping act, 1854, placed under the jurisdiction of Trinity house. Trinity house was in the practice of distributing certain funds arising from light and pilotage dues, and from the sale of ballast, for certain charitable purposes; but the right which the society possessed to the surplus of light-dues was done away with by the merchant shipping act, 1854. This same act gave Trinity house a general supervision over the commissioners of northern lights and the ballast board of Dublin, the corporations which have the charge of the light-houses and buoys of Scotland and Ireland respectively, subject to an appeal to the board of trade, to whose general superintendence Trinity house is also subject in matters relating to England. The light-houses of the isle of Man are, by special arrangement, under the charge of the commissioners of northern lights.

The corporation of Trinity house consists of a master, a deputy-master, nineteen acting elder brethren, eleven honorary elder brothers, and an unlimited number of younger brethren. The master and honorary elder brethren are chosen on the ground of eminent social position. The younger brethren all belong either to the naval service or the mercantile marine, and are admitted by the court of elder brethren. The deputy-master and acting elder brethren are elected by the court of elder brethren from such of the younger brethren as are possessed of the qualifications of having obtained the rank of commander in the navy four years previously, or having served as master in the merchant service on foreign voyages for at least four years. The board discharges its duties by means of committees and sub-committees for special purposes, whose proceedings are, when necessary, subject to confirmation by the general court. Two elder brethren of Trinity house assist the court of admiralty at the hearing of every suit for collision, and occasionally in suits for salvage. Their duty is to guide the court by advice only; though influential, their opinion is not legally binding on the judges. The gross income of Trinity house greatly exceeds the expenditure. The surplus income is chiefly devoted to the extinction of the debt incurred in pursuance of the act of 1846 for the purchase of private rights in light-houses.

TRINITY SUNDAY, the Sunday immediately following Pentecost Sunday, so called as being set aside for the special honor of the blessed Trinity. The date of the origin of this festival has been a subject of much controversy. No such festival as Trinity Sun-

day was known to the fathers of the early centuries. The most decisive evidence of its non-acceptance by the general church up to the 9th or 10th c., is the absence even to this day of any corresponding festival in the separated Greek church; and although it seems quite certain that the festival was introduced in certain particular churches of the west, at earlier and varying dates, the general establishment of Trinity Sunday as a common festival of the whole western church dates from a decree of John XXII., who died in 1334. Nevertheless, the mass and office peculiar to the day are of much greater antiquity, and may be traced, at least in part, in several sacramentaries and other liturgical books of the earlier centuries.—See Benedict XIV., *De Festis*, i. 2, 10; Binterim, *Denkwürdigkeiten Christ-katholisch. Kirche*, vol. v. part 1.

TRINO DA NECESITAS, three species of contributions, to which, in Anglo-Saxon times, all the lands of England, whatever their tenure, not excepting those of the church, were subject: viz., *brycg-bot*, for keeping the bridges and highways in repair; *burg-bot*, for keeping the fortresses in repair; and *fyrd*, for maintaining the military and naval force of the kingdom.

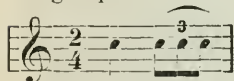
TRIO, in music, a composition for three voices or for three instruments. The same term is also applied to a movement in $\frac{3}{4}$ time in a different key, which follows a minuet or other movement, and always leads back to the previous movement in the original key.

TRIBE DE ROCHE, a name originally given by the Canadian hunters to certain lichens, species of *gyrophora*, which they are often forced to use as food, and now very generally in use as the designation of these plants. They are nutritious, but bitter, nauseous, and purgative. They have a leafy petlate thallus, variously lobed and notched—in *G. proboscidea* of a smoky-brown color, and in *G. erosa* almost black; the shields are round, without stalks, covered with a black membrane, and marked with circles and plaits upon the surface. These lichens grow on rocks in northern regions, or on high mountains. They are to be found in abundance in Spitzbergen, and a species, well known as a native of the Scottish mountains, is found in the Himalaya at an elevation of more than 18,000 feet.

TRIPITAKA. See PIT'AKA.

TRIPLÉ ALLIANCE, the name by which two different treaties are known in history; viz., 1. A treaty concluded in 1668 at the Hague between England, Holland, and Sweden, having for its object the protection of the Spanish Netherlands, and the checking of the conquests of Louis XIV. 2. An alliance concluded in 1717 between Britain, France, and Holland against Spain, which included among its stipulations that the pretender should quit France, and that the treaty of Utrecht should be carried into effect as regards the demolition of Dunkirk. The Protestant succession was guaranteed by this treaty in England, and that of the duke of Orleans in France.

TRIPILET, in music. When a note is divided into three in place of two parts, as when a minim is divided into three crotchets, a crotchet into three quavers, etc., the group is called a triplet, and it is usual to place the figure 3 over it. Thus—



TRIPOD (Lat. *tripos*, Gr. *tripous*, three-footed), any article of furniture supported on three feet. Three-legged caldrons and bronze altars more especially came under this denomination in classical times; many of them are of exquisite workmanship, and richly decorated. The sacrificial tripod in its earliest form resembled the caldron, with the addition of three rings at the top to serve as handles. Of this description seems to have been the tripod at Delphi, from which the Pythian priestess delivered her oracles, with the addition, however, of a round flat plate on the top, on which the priestess sat while giving the response, while a laurel wreath lay on it at other times. Tripods of a similar form were given as prizes at the Pythian games; and at Athens, a tripod was considered an appropriate reward for a successful choragus. Some beautiful tripods were found at Pompeii; and there are several very interesting specimens in the British museum. Analogous to the classic tripod is Thor's *kettle* in Scandinavian mythology, which was probably the origin of the witches' caldron.

TRIPOLI, a mineral substance employed in polishing metals, marble, glass, etc., so named because it was originally brought from Tripoli in Africa. It is a siliceous rock, composed of very minute particles, somewhat loosely held together, so as to yield readily to the nail, and to crumble down in water like rotten-stone. It has a coarse, dull, earthy fracture, is rough to the touch, and is of a gray, yellow, or red color. The particles which entirely compose it are the siliceous frustules of *diatomaceæ*, which occur unaltered in it, and are united together without any visible cement. Ehrenberg estimated that every cubic inch of bilin tripoli weighing 220 grains, contained 41,000,000,000 of these minute water weeds. Deposits of tripoli occur in the tertiary rocks in every quarter of the world.

TRIPOLI, a regency of the Ottoman empire, and the most easterly of the Barbary States, n. Africa, is bounded on the w. by Tunis, on the s. by the Libyan desert and Fezzan, on the e.—if we include the plateau of Barca (q.v.)—by Egypt, and on the n. by the Mediterranean. Area roughly estimated at 200,000 sq.m.; pop. uncertain, but believed to be about 1,000,000. Tripoli is less mountainous than the rest of Barbary, the Atlas range terminating here in a couple of chains running parallel to the coast, and never exceeding 4,000 ft. in height. There are no rivers in the country, and rain seldom falls during the long hot summers, but the dew is copious, and supports vegetation in favored spots. The coast region (about 1100 m. in length) is very fertile about Tripoli and Mesurata, where all sorts of tropical fruits, grain, wine, cotton, madder, etc., are produced; but further e., along the shores of the gulf of Sidra, sandy desolation reigns. The interior yields senna, dates, and galls; the carob and lotus are indigenous. Sheep and cattle are reared in great numbers, and Tripoli is also noted for its small but excellent horses, and its strong and beautiful mules. The commerce of the country consists in exporting, principally to Malta, and the Levant, the products of the country and of the interior of Africa (gold-dust, ivory, natron), which are brought hither in caravans across the desert. The imports (which consist chiefly of European manufactures) have been declining gradually of late years, owing mainly to two causes. The *first* is the new direction which the trade of central Africa is assuming. By the Niger and its great tributary—the Benue—European manufactures are more rapidly and more economically conveyed to the northern intertropical regions than by the tedious overland route of the great Sahara. The *second* cause is the abolition of the slave-trade, which, of course, has stopped the demand for all the commodities that alimanted the traffic.

Tripoli is subdivided into four *livas*, or provinces—Tripoli, Benghazi, Mesurata, and Gadames. The gov.gen. has the title, rank, and authority of a pasha of the Ottoman empire. He is appointed by the sultan, and in his turn appoints the subordinate governors of the Tripolese provinces, who bear the title of beys. The military force of the country consists of a body of Turkish soldiers, some 10,000 in number, whose business is to keep down insurrections, but who were formerly wont to vary it by creating them. The natives (who comprise Libyan Berbers, Moors, and a few Arabs) pay to the imperial government, by way of tribute, a tenth of all the products of the soil; and there is, besides, a special tax imposed on every olive-tree and date-tree, on every camel, on all horned-cattle, on sheep and goats, and on Jewish residents. Little wisdom and less justice are shown either in the imposition or collection of the taxes.

In ancient times Tripoli (when we first read of it) appears to have formed the most westerly portion of the territory of Cyrenaica (Barca), or at least to have been tributary to the Cyrenaicans, from whom, however, it was wrested by the Carthaginians. It next passed to the Romans, who included it within the province of Africa, and gave it the name of *Regio Syrtica*. About the beginning of the 3d c. A.D. it became known as the *Regio Tripolitana* (on account of its three principal cities, Cæa, Sabrata, and Leptis, which were leagued together; whence its present name Tripoli), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Like the rest of n. Africa, it was conquered by the Arabs (see BARBARY), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1552 the Turks got possession of it, and have ever since been the rulers of the country, though the authority of the sultan, up till 1835, had been virtually at zero for more than a century. In that year, however, an expedition was dispatched from Constantinople; the ruling dey—Karamanli—in whose family the sovereignty had continued uninterrupted since 1714) was overthrown, and imprisoned; a new Turkish pasha, with vice-regal powers, was appointed, and the state made an eyalet of the Ottoman empire. Several rebellions have since taken place (notably in 1842 and 1844), but they have always been suppressed.

TRIPOLI, called by the Turks *Tarabûlûs*, and probably the *Cæa* of antiquity, the capital of the foregoing state, lies on a bit of rocky land projecting into the Mediterranean, and forming a bay. It is surrounded by high walls, with bastions, and is irregularly built, but has beautiful gardens. There are 12 mosques, 3 synagogues, and 2 Christian churches. Pop. about 24,000. Though the majority are Moslems, nearly all the trade is in the hands of Jews and Christians. The overland trade to Sudan has greatly fallen off. The exports have an annual value of about £500,000.

TRIPOLI, *Tarabûlûs*, a sea-port of Syria, is 40 m. n.n.e. of Beyrout. The houses are mostly of stone. In and around the town are many remains of antiquity and traces of middle-age architecture. Originally an important maritime city of Phœnicia, the ancient *Tripolis* was besieged and taken by the crusaders in the 12th century. The harbor is small and shallow. Fruit is exported to the annual value of £120,000; also oil, grain, silk, tobacco, and sponges. Pop. (chiefly Greek), about 25,000.

TRIPOLI, or **TRIPOLIS** (in its modern Arabic form, *Tarabûlûs*), the ancient *Tripolis*, a sea-port, and one of the chief commercial towns of Syria, capital of a pashalic in the eyalet or government of Sidon, is situated near the coast, on the eastern border of a small triangular plain running out into the Mediterranean, and on both sides of the river Kadisha. The town is substantially built of stone, with many remains of mediæval architecture, and is supplied with excellent water by an aqueduct. It is surrounded by

gardens of orange, lemon, mulberry, apricot, and other fruit trees, which are planted also in the town itself, and give the place a rich and picturesque appearance; but the low marshy neighborhood renders the place unhealthy. On the left side of the river stands the castle built by count Raymond of Toulouse, in the 12th c. when the city was taken by the crusaders. At the n.w. apex of the plain already mentioned lies the port of Tripoli, called El-Mina (the landing-place), or the Marina, a small fishing-village about $1\frac{1}{2}$ m. distant from the town. The harbor—like other harbors on the Syrian coast, scarcely deserving of the name—is formed by a line of low rocky islets stretching n.w. from the point. The trade of the place has of late much declined, being superseded by that of Beirût; its exports now consist chiefly of silk, sponges, and tobacco; there are also manufactures of soap. Pop. variously stated at 13,000 and 20,000, and consisting of Mohammedans and Greek Christians. It is the see of a Greek bishop. Tripoli is regularly visited by the steamers of the French Messageries.

The ancient city of Tripoli was situated on the plain where immense numbers of granite shafts and other relics of antiquity are still found. Its name (the *Three Cities*, or the *Triple City*) was derived from the circumstance of its being founded by the cities of Tyre, Sidon, and Aradus, as an entrepôt for trade, and a point of federal union. It was for many centuries a place of great commercial importance.

TRIPOLIT'ZA ("three cities"), a t. of Greece, under the Turkish rule capital of the Morea, now the chief town of the government of Mantinea, lies 22 m. s.w. of Argos, and 39 s.w. of Corinth, in a plain 3,000 ft. above the sea. It derives its name from being near the sites of the three ancient cities, Tegea, Mantinea, and Pallantium. In 1821 it was stormed by the Greek insurgents; and in 1828 razed to the ground by the troops of Ibrahim Pasha; it has since, however, been rebuilt. Previous to 1821 it had 20,000 inhabitants; the present pop. is only 7,441.

TRIPP, a co. in s. central Dakota, bordering on Nebraska; 1500 sq.m.: pop. not given in census of '80. There are no settlements as yet in this county. Turtle hill, in the n., is 2,500 ft. high.

TRIP PANT, in heraldry, a term analogous to passant (q.v.), but applied to animals of chase.

TRIPTOLE'EMUS, in Greek legend, the son of Celeus, king of Eleusis. Ceres taught him to plant corn and make bread, and he introduced agriculture into Attica. Ceres also gave him her chariot drawn by dragons, and he went over the earth feeding the inhabitants and teaching them agriculture. On his return to Eleusis he began festivals in her honor. He was worshiped with divine honors after his death.

TRIPTYCH (Gr. *tris*, thrice, and *ptycho*, I fold), a set of tablets consisting of three leaves, each painted with a distinct subject, but joined together by hinges, and capable of being folded so as to present a new face. The general character of such tablets has been explained under diptych (q.v.), the difference of name, "triptych," "polyptych," being taken from the number of the leaves. In ecclesiastical use, the diptych has been already explained as commonly meaning rather the register of names inscribed on the tablets than the tablets themselves. The triptych, on the contrary, generally speaking, contained sacred pictorial representations rather than written registers or records.

TRI'REME (from *tres*, three, and *remus*, an oar) is the designation given in ancient times to a galley having three banks of oars. It is said to have been first employed by the Corinthians in their war with Corcyra, 664 B.C. In the Persian and Peloponnesian wars, triremes were the largest vessels employed; but at the time of Alexander, we find that galleys with four and five banks had gradually come into favor. In the Punic wars, the Carthaginians generally employed quinqueremes; and as the Roman triremes could have no chance against vessels with such high bulwarks, the Romans henceforth constructed their war-vessels after the model of the Carthaginian quinquereme.

The banks of oars were elevated above each other, but not perpendicularly; and the lowest rank of rowers having the shortest oars and easiest work, had the least pay. The trireme or quinquereme was also provided with a square sail, which was used when the wind was favorable for voyaging, to relieve the labor of the rowers, but it was not employed in action. The crew consisted of about 200 men; and on a smooth sea, in speed and accuracy of maneuvering, the trireme was little inferior to a modern steamboat. In the earlier times, before the Persian war, and even later, victory depended more upon the number and valor of the soldiers on board, than upon the skill of the seamen. Herodotus mentions that besides the crew there were 40 marines serving on board each Ionian trireme. The Athenians improved this system by decreasing the number of fighting men, and trusting more to the skillful management of their vessels. In a fight, the aim of each trireme was not as before, to grapple with its opponent, but to dash with the greatest momentum possible with its beak against the enemy's vessel, and strike it amidship, or, at any rate, disable his banks of oars on one side. Fighting men were not so much wanted for these tactics; and so we find later on, in the Peloponnesian wars, the number of marines in each ship reduced to ten. It is singular to see this system of ram-fighting coming once more into vogue. A contrivance for strengthening the prow of the trireme, and increasing its efficiency as a ram, gave the Syracusans their final victory over the Athenians in the harbor of Syracuse.

TRISAGION, or **TRISHAGION** (Gr. *tris.*, thrice, and *hagios*, holy; Lat. *tersanctus*, thrice holy), one of the doxologies in use in the Greek church, which is repeated in the form of versicle and responses by the choir in certain parts of the liturgy. The words of the trisagion are: "*Hagios O Theos, Hagios Ischuros, Hagios Athanatos, eleison hemas!*" (O Holy God, O Holy Mighty One, O Holy Immortal, have mercy on us!) This doxology, in its original Greek form, is one of the few fragments of the Greek liturgy which (like the *Kyrie Eleison*) are retained in the original language in the Roman mass. It occurs in the service of Good Friday in the procession and veneration of the cross. See **GOOD FRIDAY**.

TRISMEGISTUS (Gr. thrice-greatest), an epithet applied to the Egyptian Hermes (q. v.), or Thoth (q. v.), by the Neoplatonists and the devotees of magic, alchemy, and mysticism generally, who looked upon him as the source of all mysterious doctrines. See **HERMETIC BOOKS**.

TRISMUS NASCENTIUM is a form of lockjaw occurring in newly born children, in consequence mainly of impurity of the atmosphere. In Iceland, this disease annually carries off a large proportion of infants between the fifth and twelfth days after birth; in some parts the mortality being nearly *two out of three*. It is also very frequent and fatal in the West Indies, where it is known as the "ninth-day disease." Another of its names is "the jaw fall," from the circumstance of the jaw relaxing and dropping on the breast shortly before death. The complaint used to be common in hospitals when ventilation was less attended to than at present; but with the introduction of a better system of ventilation, the mortality has been very much reduced. In so fatal a disease it is almost unnecessary to refer to treatment. Immediate removal to a pure air, a warm bath, and a dose of castor-oil, should be tried.

TRIST, **NICHOLAS P.**, 1800-74; b. Va.; graduate of West Point, acting assistant prof. of French, 1819-20; chief clerk of the state department, 1845. In 1848 he negotiated the treaty of Gaudaloupe Hidalgo at the close of the Mexican war. He was U. S. consul to Havana under Jackson. He married a granddaughter of Thomas Jefferson.

TRISTAN DA CUNHA, an island in the s. Atlantic ocean, lies midway between the coast of South America and the cape of Good Hope, in 37° 6' s. lat. It is about 20 m. in circumference. In 1816 a company of British artillery was stationed on the island for the purpose of keeping a watch on Napoleon, at that time a prisoner in St. Helena, from which Tristan da Cunha is distant about 1300 miles. On the death of Napoleon in 1821, the soldiers were withdrawn, with the exception of a corporal named Glass, and one or two companions, who were left in charge of the small fort that had been erected. These men finding the soil very fertile, proceeded to cultivate the island, and their efforts were attended with marked success; inasmuch that they were enabled to carry on a brisk trade in the produce with any passing ships that might stand in need of fresh provisions. The colony flourished, and in 1829 numbered 27 souls. When visited by H.M.S. *Challenger* in Oct., 1873, the place was found to be still thriving; the inhabitants numbered 80, and the cattle had increased to 600, with an equal number of sheep. In the vicinity of Tristan da Cunha are two other islands—one of them, Inaccessible Island, 20 m. distant, possessing a special interest from the circumstance of its having harbored two Germans of the name of Stoltenhoff, who underwent a kind of Robinson Crusoe experience there. They were landed on this desolate island Nov. 27, 1871, when making their way to the larger island of Tristan da Cunha, and determining to settle there, experienced many privations, being sometimes reduced to great extremities; though, unlike Robinson Crusoe, they had more than one opportunity of quitting the island in the course of their two years' sojourn. They were at length, however, fain to take advantage of the opportunity afforded them by the *Challenger* of leaving the island, which they accordingly did on Oct. 16, 1873.

TRISTRAM is the hero of a British legend, which originally had no connection with the stories of king Arthur and the round table, although later minstrels sought to interweave them. Briefly, the legend goes as follows:

Tristram, son of Rouland Rise, lord of Ermonie, and Blanche Fleur, sister of Mark, king of Cornwall, having lost both parents at the period of his birth, is brought up for the first 15 years of his life at the court of the monarch who had slain his father, after which he proceeds to Cornwall, and is acknowledged by his uncle, who appoints him his heir and successor. Having received a severe wound in a duel, he is cured by Ysolt or Ysonde, daughter of the queen of Ireland; and, on his return to Cornwall, informs his uncle of the marvelous beauty of the Irish princess. Mark is charmed, and sends his nephew to Dublin, at the head of a select body of knights, to solicit her hand in marriage. The king's suit is successful, and Tristram escorts her on her voyage to England, but both having unwittingly partaken of a love-potion (which was intended for Mark), they are immediately inflamed with a criminal passion for each other, which is the source of all their subsequent misfortunes. Ysolt is married to the king of Cornwall; but, by the help of her clever maid, Brenwain, she contrives to have numerous secret interviews with her lover, and for some years succeeds in allaying the jealousy and suspicions of her husband. At last, however, Tristram is banished from Cornwall, and goes to Wales, where he performs prodigies of valor. His uncle again becomes reconciled to

him, and invites him back to his court, where the amours of the incorrigible lovers are renewed. A renewed banishment is the consequence, and Tristram goes abroad to Spain, Ermonie, Brittany, in the last of which countries he marries another Ysolt, called, for distinction's sake, Ysolt *with the white hand*, daughter of the duke of Brittany. In one of his exploits he is desperately wounded, and can only be cured by Ysolt of Cornwall. He dispatches a messenger to the princess, telling him that on his return he is to hoist a white sail as he approaches the coast of Brittany, if Ysolt accompanies him; but if not, a black sail. The queen of Cornwall hastens to save her lover; and as the vessel nears the shores of France, Tristram's wife, Ysolt *with the white hand*, recognizes the white sail, and, fired with jealous hate at the thought of a rival's approach, hurries to her husband's chamber, and tells him the messenger's ship is coming in with black sails spread. Tristram, in an agony of disappointed love, sinks back and expires. When the queen of Cornwall lands, and hears of his death, she rushes to the castle, throws herself on his corpse, and dies beside him. King Mark subsequently learns the story of the love-potion, and buries the twain in one grave, planting over Ysolt a rose-bush, and over Tristram a vine, which grew up so inextricably intertwined that no man could ever separate them.

The popularity of the story in the middle ages was unbounded. The scene of the principal exploits, and the residence of the principal personages, is Cornwall, from which one is disposed to claim a British or Welsh paternity both for the legend and the literature; and this is the view that underlies sir Walter Scott's argument in behalf of the purity of the metrical version of *Sir Tristram* which he published (ed. 1806) from the Auchinleck MS., and which is considered to be the composition of Thomas the Rymer (q.v.). As early as the middle of the 12th c., however, the legend had become a favorite throughout the whole of France; and it subsequently found its way into Spanish, Italian, German, Scandinavian, Slavic, and Greek literature. *Tristram and Isolde* is the subject of one of Wagner's operas. See Michel's *Tristan* (1835), and Bossat's (1865).

TRITICUM. See WHEAT and COUCH GRASS.

TRITON, in Greek mythology, a son of Poseidon and Amphitrite, who dwells with his parents in a golden palace at the bottom of the sea. He usually figures as an attendant on his father, riding over the Mediterranean on a horse or other sea-monster, and soothing the turbulent waves by blowing his shell-trumpet—his "wreathed horn," as Wordsworth calls it. The later poets speak of Tritons, in the plural, as a race of subordinate sea-deities, who are described by Pausanias as having sea-green hair and eyes, gills below the ears, human noses, broad mouths with the teeth of animals, scales on their bodies, and, instead of feet, a tail like that of a dolphin. They were frequently represented in works of art.

TRITON, a genus of water-salamanders belonging to the second section of the order *urodela*. The land-salamanders also belong to this section. The tritons, water-salamanders, or newts, are distinguished from the land-salamanders by having a compressed, fish-like tail, and by being strictly oviparous. The larvæ are tadpole-like, having external branchiæ which they retain till about the third month. The adults are without gills, breathing wholly by lungs, but they retain the larval tail throughout life. The tongue is small, free, and pointed behind, and there are two rows of palatine teeth: fore-feet 4-toed, hind-feet 5-toed. The males have a crest on the back and tail. The development of the newts is much like that of the frogs, with the following two points of difference: 1. The embryonic tail is not cast off in the adult; 2. The fore-limbs appear externally sooner than the hind-limbs. The name triton is also applied to several univalve mollusk shells, commonly called conch-shells.

TRIUMPH (Lat. *triumphus*) was the name given in ancient Rome to the public honor bestowed on a general who had been successful in war. It consisted in a solemn procession along the *Via Sacra* up to the capitol, where sacrifice was offered to Jupiter. The victor sat in a chariot, drawn by four horses—his captives marching before, his troops following behind. Certain conditions had to be fulfilled before a triumph could be enjoyed, and it was the business of the senate to see that these were enforced. Under the empire generals serving abroad were considered to be the emperor's lieutenants, and, therefore, however successful in their wars, they had no claim to a triumph. They received instead *triumphal decorations* and other rewards.

The appearance that Rome presented on the occasion of a triumph, especially in later times, was joyous in the extreme. All work was suspended; the temples were thrown open, and decorated with flowers; the populace were clad in holiday attire, and crowded the steps of all the public buildings in the *Via Sacra*, and the forum, or mounted the scaffoldings erected for the purpose of viewing the procession; banquets were spread before every door. As for the *imperator* himself, after having pronounced a eulogy on the bravery of his soldiers, he ascended his triumphal car, entered the city by the *porta triumphalis*, where he was met by the senate, and now the procession began. First marched the senate, headed by the magistrates; next came a body of trumpeters; then a train of carriages and frames laden with the spoils of the vanquished; then a body of flute-players, followed by the oxen doomed to be sacrificed, and the sacrificing priests, etc.; then the distinguished captives with bands of inferior prisoners

in chains; after whom walked the lictors of the imperator, having the fasces wreathed with laurel. Next came the hero of the day—the imperator—in a circular chariot, attired in an embroidered robe (*toga picta*) and flowered tunic (*tunica palmata*), bearing in his right hand a laurel bough, in his left, a scepter, and having his brows garlanded with Delphic laurel. He was accompanied by his children and his intimate friends. His grown-up sons, the legates, tribunes, and equites, rode behind; and the rear was brought up by the rest of the soldiery, singing or jesting at their pleasure, for it was a day of carnival and license. When the procession had reached the capitoline some of the captive chiefs were taken aside and put to death; the oxen were then sacrificed, and the laurel wreath placed in the lap of Jupiter. In the evening the imperator was publicly feasted, and it was even customary to provide him a site for a house at the public expense.

The *ovation*, or lesser triumph, differed from the greater chiefly in these respects: that the imperator entered the city on foot, clad in the simple *toga prætexta* of a magistrate; that he bore no scepter, was not preceded by the senate and a flourish of trumpets, nor followed by his victorious troops, but only by the equites and the populace, and that the ceremonies were concluded by the sacrifice of a sheep instead of a bull, whence, doubtless, the name *ovation* (from *ovis*, a sheep). The *ovation*, it is scarcely necessary to add, was granted when the success, though considerable, did not fulfill the conditions specified for a triumph.

TRIUM VIRATE (Lat. a union composed of *three* men) is the name given in Roman history to the private league entered into between Pompey, Crassus, and Cæsar—the three most powerful men of their time; the object of which was to carry out their own schemes of political aggrandizement, in spite of the opposition of the senate. This compact was not a triumvirate, in the proper sense of the term: it had no legally constituted existence: it was, in fact, only a treasonable conspiracy of three men against the legitimate authority of the state. The term is less incorrectly applied to the division of government between Octavian (Augustus), Mark Antony, and Lepidus in the civil wars that followed the murder of Cæsar—an arrangement sanctioned, and, therefore, legalized by the senate. The former is usually called the *first*, the latter the *second* triumvirate.

TRIVIAM, Three Roads, the name given to the lower section of the seven liberal arts (see **ARTS**), constituting the circle of study in the middle ages. It embraced grammar, logic, and rhetoric.

TROCHIDÆ, a family of gasteropodous mollusks, of the order *pectinibranchiata*, section *asiphonata*. The shell has the aperture entire, closed with an operculum; spiral, and very generally top-shaped, as in the genus *trochus*, the species of which are popularly known as top-shells. The species are very numerous, and widely distributed. They feed on sea-weeds, and some of them are found on rocks between high and low water mark. Many of them are very beautiful, and some of the small kinds are often employed to adorn head-dresses, and for other ornamental purposes, the epidermis and outer layer being removed. Several species are frequent on the British shores. Some of the tropical ones attain a comparatively large size. The trochidæ are very closely allied to *turbinidæ*.

TROCHILUS and **TROCHILIDÆ**. See **HUMMING-BIRD**.

TROCHU, LOUIS JULES, b. France, 1815; received his education at the military academy of St. Cyr, and in 1837 entered an artillery regiment as lieutenant. He fought in the Crimean war, was made a gen. of division, and in this capacity received a command in the Italian campaign of 1859. In the crisis which followed the battle of Sedan, during the Franco-German war of 1870-71, gen. Trochu was made governor of Paris and commander-in-chief of all the forces destined for the defense of the capital, which position he held until the city surrendered. In Oct., 1871, he was elected president of the council-general for Morbihan, but he afterward resigned that post, and has lived in retirement since 1873. His pamphlet on *L'Armée Française en 1867*, reached its 20th edition in 1870. In 1873 he published *Pour la Vérité et pour la Justice*, in justification of the government of the national defense.

TROEZEN, or **TROEZENE**, an ancient city in s.e. Argolis, Greece. It was supposed to have been founded by Ionians, and is mentioned by Homer. After the Dorian invasion of the Peloponnesus it became a Doric city. After Thermopylæ the Greek naval forces met at Trœzen, and were aided by the people of that place, who sent 1000 men and five ships to Artimisiûm and Salamis. In the Peloponnesian wars the city sided with the Spartans, and later came under the rule of Macedonia. The city is described by Pausanias as flourishing in the 2d c. of our era.

TROGLODYTES (Gr. *trôglodytai*—Gr. *trôgle*, a hole, and *dypo*, to get into; hence cave-dweller), the name given by the ancient Greeks to various tribes or races of uncivilized men, who dwelt either in natural caverns, or in holes which they had dug for themselves in the earth. They are mentioned by Strabo as existing as far w. as Mauretania, and as far e. as the Caucasus; but perhaps the best-known troglodytes of ancient times were those of southern Egypt and Æthiopia, where a considerable district of country was called *Regio Troglodytica*. They could not speak articulately, but shrieked or screamed like the lower animals; though it ought always to be remembered that the Greeks, from

whom we have such statements, are not very trustworthy authorities in the matter of language, accounting every dialect which they did not understand a barbarous jargon. The chief occupation of the troglodytes was herding cattle, though we also read that they were hunters and robbers. They are likewise mentioned as serving among the light troops in the army of Xerxes. Their habits of life were rude and debased; they are reported to have eaten not only the flesh, but the bones and hides of their cattle; their drink is said to have been a mixture of milk and blood; and they had a community of wives. The wives tattooed their bodies; and the men, if not clothed in cattle-skins, went about *in puris naturalibus*. But the most revolting and unnatural of their practices was their treatment of the dead. They are reported to have bound the corpse neck and heels together, affixed it to a stake, pelted it with stones, amid shouts of laughter; and after they had buried it beneath a cairn of missiles, to have placed a horn on the top, and gone away!

What measure of truth there may be in such stories, it is now impossible to say; but archaeological investigations into the pre-historical life of our own and other countries, have led to the conclusion, that a race of cave-inhabiters preceded in most countries the races that lived in houses built on the surface of the earth; and perhaps we shall not be far wrong if we regard troglodytism as the primitive state of all, or the greater part of, mankind.

TROGONIDÆ, a family of birds, ranked by some naturalists, on account of their habits, in the order *insectivores*, and tribe *fiavivores*; but more generally, on account of the formation of the feet—two toes before, and two behind—placed in the order *scansores*. The trogonidæ are remarkable for the beauty of their plumage, which is soft, full, and brightly colored. The bill is short, strong, with a wide gape; the tail generally long, in some species very long; the feet small, and in many, feathered almost to the toes. All the trogonidæ are tropical: they belong chiefly to the south-eastern parts of Asia, the Indian archipelago, and South America. They abound most of all in South America. They inhabit forests, where they sit motionless on branches, waiting for insect prey, darting upon insects as they fly past. They make their nests in the hollows of decayed trees. Their flesh is highly esteemed for its delicacy and flavor. They are all of small size. In brilliancy of plumage, some of them are excelled by no birds except humming-birds.

TROIZK, a t. of e. Russia, on the border of Siberia, in the government of Orenburg, stands on the Oug, 420 m. s.w. of Tobolsk. It is the seat of considerable commerce, especially during the summer months, at which season a large trade is carried on with the Kirghis and the Bokharians, who arrive in caravans from central Asia. Pop. '67, 7,741.

TROLLOPE, ANTHONY, second son of Mrs. Frances Trollope, and one of the most popular novelists of the day, was b. in 1815. He was educated at Winchester, and subsequently Harrow. While filling a responsible official situation in the post-office, he has found, or made, leisure to amuse the public with a long series of novels, of very remarkable merit. The first work which decisively drew attention, *The Warden*, was followed by a continuation, *Barclay Towers*, which remains, perhaps, the cleverest of all his books. In rapid succession to these, came *Lector Thorne*, *The Bertrams*, *The Three Clerks*, *Castle Richmond*, *Franklin Passmore* (originally published in the *Cornhill Magazine*), *The Kellys* and the *O'Kellys*, *Orley Farm*, *The Small House at Allington* (contributed to the *Cornhill Magazine*), *Eschel Ray*, *Miss Mackenzie*, *Can You Forgive Her*, *Ralph the Heir*, *The Golden Lion of Granpere*, and other works. Besides these, Mr. Trollope has published several pleasant volumes of travels about *The West Indies and the Spanish Main*, on *North America*, on *Australia*, and on *South Africa* (1878). Trollope is at this moment one of the most popular of our living novelists. He does not go very deep; but he sketches the superficial aspects of society with a charming lightness and facility of touch, and is unfailingly agreeable and amusing.

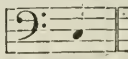
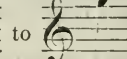
His elder brother, THOMAS ADOLPHUS, has lived for many years at Florence, and is favorably known to the public by his *Girlhood of Catherine de Medici*, *A Decade of Italian Women*, and a number of novels such as *La Beata*, *Marietta*, *Lindisfarn Chase*, *Genova*, *The Garstangs*, *The Dram Numbers*. He has also written a *History of Florence*, and in 1877 the *Life of Pius IX.*

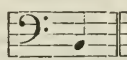
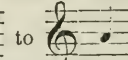
TROLLOPE, MRS. FRANCES, a novelist and miscellaneous writer of some eminence, was b. in the year 1780. Her father was an English clergyman. In 1809, she was married to Mr. Anthony Trollope, a barrister-at-law. In 1829, she went to America; and during a three-years' residence in the United States, amassed the materials of her first book, *Domestic Life of the Americans*, published in 1832. This work attracted great attention; and the severity of certain of its strictures was much resented by our sensitive cousins over the water. From this time forward, the literary activity of Mrs. Trollope was nearly uninterrupted, and her name became one of the more notable of the time. Novels of society and impressions of travel make up the sum of her works. Of her novels, the most successful is, perhaps, *The Widow Barnaby* (3 vols., 1839); with its sequel, *The Widow Married* (3 vols., 1840); followed by *The Barnabys in America*, or *the Adventures of a Widow Married*. Mrs. Trollope was a woman of strong talent, and her works are full of shrewd observation, and true, if at times somewhat coarse, humor.

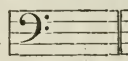
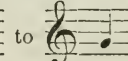
They were popular in their day, and very well deserved their popularity; but already they are well-nigh forgotten. No list of them in detail seems needed. During the life of her husband, Mrs. Trollope resided chiefly at Harrow. During her later years, much of her time was passed in Italy, where her eldest son, Thomas Adolphus, had taken up his abode. She died at Florence, Oct. 6, 1863.

TROLLS, in mythology, misshapen dwarfs, inhabiting hills and mounds, having abnormal thieving propensities; stealing children and substituting their own offspring for them. They were peculiarly sensitive to noise, which was their especial aversion, reminding them of the hammer of Thor, which he was accustomed to throw after them. They were called the hill-people. Though strong, they were easily outwitted by men.

TROMBONE (Ital. great trumpet), a large, deep-toned brass instrument, of the trumpet species, but consisting of two separate parts, so constructed that the two ends of one fit into those of the other, and consequently, by sliding the one part in or out, the tube through which the air passes may be shortened or lengthened, and the pitch changed at pleasure. Three kinds of trombone are in general use, differing in pitch; the *alto trom-*

bone, with a compass extending from  to ; the *tenor trombone*,

with a compass from  to ; and the *bass trombone*, whose compass

extends from  to . The music for these instruments is written

on the alto, tenor, and bass clefs respectively. There is also a *double-bass* trombone, which is but rarely used. The trombone, if judiciously employed, is a very effective instrument in an orchestra—the tone is grander and more powerful than that of the trumpet.

TROMP, a blowing-machine actuated by a current of falling water. It is used in mountainous districts for supplying air to furnaces. A large pipe, usually about 2 ft. in diameter, leads from an upper reservoir of water to a cistern 25 or 30 ft. below it. A few feet beneath the reservoir the pipe is contracted to a funnel shape, and immediately below this, where it widens, there are a number of holes for the admission of air, which rushes in to supply the partial vacuum created by the descending water, which, together with the air, is carried to the lower cistern, where separation is effected, the water passing out at the bottom and the air out at the top, at a pressure regulated by the rate of exit of the water.

TROMP, CORNELIS VAN, 1629–91; b. Rotterdam, Holland; son of Maarten Harpert-zoon. When but 21 years old he was made a vice-admiral, as a reward for his success in fighting African pirates and the English. In 1666 he fought with distinction in the first battle with the English, but in the contest of July 25 his conduct did not meet with De Ruyter's approval, and he was removed. In the war of 1673 he again served with distinction; and, after De Ruyter's death, succeeded him in command. He was afterward at the head of the Danish navy.

TROMP, MARTIN HARPERTZON, a celebrated Dutch admiral, was b. at the Briel in 1597. When a boy he went to sea with his father, a commander in the Dutch navy. In an engagement off the coast of Guinea with an English cruiser, his father was killed, and young Tromp made prisoner. His captors compelled him to serve as a cabin-boy for two years and a half, after which his history becomes for some time obscure. In 1622 we find him a lieutenant on board a Dutch ship-of-the-line; and two years afterward prince Maurice gave him command of a frigate. In 1629 the famous admiral Peter Hein took command of Tromp's ship, and was killed by his side. Disgusted by some real or imaginary slight, Tromp about this time retired from the service. In 1637 he returned, and was created lieutenant-admiral by the stadtholder Frederick Henry. He was appointed to the command of a squadron of eleven ships. He now prosecuted a vigorous naval war against the Spaniards, taking in one celebrated action, fought on Oct. 21, 1639, 13 richly-laden galleons. But the events which were to render the name of Tromp immortal did not occur until the commencement of hostilities between England and Holland in 1652. On May 19 of that year he encountered the English fleet under admiral Blake. The Dutch were defeated with the loss of two ships-of-war. Tromp was for a while superseded in command by Ruyter and De Witt, but he was soon afterward reinstated. On Nov. 29, same year, he again encountered Blake in the strait of Dover. This time success was decidedly with the Dutch. The English fleet was obliged to retire; and Tromp sailed up the channel with a broom at his masthead, to denote that he had swept his foes from the seas. They were, however, not long in returning. On Feb. 18, 1653, Monk and Deane having been united in command with Blake, they attacked Tromp near Portland, and defeated him, though only after a contest memorable for its obstinacy. It lasted three days, at the close of which Blake had

taken or destroyed 11 ships-of-war and 30 merchantmen, killed 2,000 of the enemy, and captured 1500. On June 2 and 3 following, another terrific battle took place off n. Foreland, in which six Dutch vessels were captured, 11 sunk, and the remainder driven into Calais roads. On July 31 the warfare was again renewed off the coast of Holland. On this occasion the Dutch lost 30 men-of-war, and admiral Tromp was killed.

Tromp was a thorough seaman, homely in manner, benevolent in disposition, and enthusiastic in his calling. He was buried at Delft, with great pomp and solemnity.

TROMSØE, a small island on the n.w. coast of Norway, in Finmark, lies between the island Kvalø and the main-land. It is 4 m. long and about $1\frac{1}{2}$ m. broad. On the eastern side of the island is the small but thriving town of the same name, the seat of a bishop. Russian vessels from Archangel and the White sea visit this town, and bring corn, which they exchange for dried fish. Pop. about 3,000.

TRON, or **TRONE**, weight, the most ancient system of weight used in Scotland, is so called from *trone*, a species of heavy beam or balance set up in the market-place and employed for the weighing of heavy wares. The weights employed in the public markets formed the most convenient reference, and consequently tron weight became the standard. The tron lb. contained 20 oz., but from the custom of giving "one in" to the score, was always reckoned at 21 oz.; this was the most general value; but it varied in the different market-towns between this and 28 oz. The later tron stone or standard weight contains 16 tron lbs., each lb. 16 tron oz., and each tron oz. 16 drops; the tron lb. is estimated to be equivalent to 1.3747 lbs. avoirdupois.

TRONDHJEM. See **THRONDHJEM**, *ante*.

TRONN, an important sea-port in the county of Ayr, Scotland, 8 m. s.w. of Kilmarnock, and 6 m. n. of Ayr. The greater part of the town (which is not older than the present century) occupies a bare and level promontory; but along the broad and beautiful strand of Ayr bay, known as the "south beach," stretches, for nearly half a mile, a row of handsome villas and cottages, built chiefly for the accommodation of summer visitors. The place is yearly becoming more attractive as a sea-coast residence, partly on account of its extreme salubrity, and partly on account of the ample scope afforded by its wide stretch of sands for the simple amusements of the sea-shore. The harbor, which occupies the extremity of the promontory, is secure and spacious, and is much frequented. The principal exports are coal and iron, of which Ayrshire yields an abundant supply. Pop. in '71, 2,790.

TROOP, in cavalry, the unit of formation, forming the command of a captain, consisting usually of 60 troopers, and corresponding to a company of infantry. The officers of a British troop are the captain and two lieutenants. Two troops form a squadron. The trooper's pay is 1s. 5d a day.

TROOPIAL, *Molothrus*, a genus of birds of the family *sturnidæ* (see **STARLING**), having a short, thick, conical bill; long, pointed wings; and a slightly rounded tail. The cow troopial (*M. pecoris*), also called cow black-bird, cow-pen bird, etc., is common in North America, passing the winter in southern parts of the continent, and migrating northward in spring. Its plumage is of a shining black color except the head and neck, which are blackish-brown. It is very generally to be seen in attendance on cattle, picking up the insects which they disturb, or which are attracted by their droppings. Like the cuckoo, it makes no nest of its own, but deposits its eggs in the nests of other birds.

TROOST, GERARD, 1776-1850; b. Holland; educated at the university of Leyden; captured by a privateer in 1809, while on his way to Java, on a scientific expedition under the patronage of Louis Bonaparte, king of Holland; he became a resident of Philadelphia, where he founded the academy of natural history, of which he was the first president. He was for a time professor of chemistry in the Philadelphia college of pharmacy, and afterward a member of Robert Owen's New Harmony community. In 1828 he became professor of chemistry, geology, and mineralogy in the university of Nashville.

TROPÆOLUM, a genus of plants of the natural order *tropæolacæ*. This order is allied to *balsaminacæ* and *geraniacæ*. The species are not numerous, and are all natives of South America. They are smooth herbaceous plants, somewhat succulent, with an acrid or pungent taste, trailing or twining stems, and alternate simple or divided leaves, destitute of stipules. The species of the genus *tropæolum* form the greatest part of the order, and have usually simple peltate leaves. *T. majus* is the well-known **INDIAN CRESS** of our gardens, the unripe fruit of which is often used to give pungency to pickles, under the name of *nasturtium*. It is a native of Peru, and has long been much cultivated in Britain as an ornamental plant, climbing among bushes or on trellises, and taking hold by the curving stalks of its leaves; its stems from 6 to 10 ft. long, its foliage abundant, and its flowers large, orange, or dark red. The young leaves are used in salads. The Indian cress is really a perennial, although it flowers within a few months from the time of sowing, and in Britain is always treated as an annual, not being able to endure the winter. *T. minus* is very similar, but of weaker growth, and its flowers smaller. *T. peregrinum*, although much more recently introduced into Britain than the Indian cress, has now become almost equally common, and is a great favorite in flower-gardens. It is popularly called the **CANARY PLANT**,

Its stems are long and slender, and it speedily covers a high trellis. Several other species are frequent and fine ornaments of gardens and green-houses. The tubers of *T. tuberosum* are eaten in Peru. Their taste is peculiar.

TROPE (Gr. *tropos*, a "change," a "turning") is the name of a figure of speech which does not appear to differ from metaphor (q.v.).

TROPHONIUS, in Greek legend, was the most skillful architect of his day, and was the son of Erginus, king of Orchomenus, or of Apollo. Along with his brother, Agamedes, he built the temple of Delphi and the treasury of king Hyrieus in Bœotia, which the two are said afterward to have plundered. After his death he was worshiped as a hero, and had a celebrated oracle at Lebadeia (Livadia) in Bœotia. "The entrance to the oracle was a very narrow aperture on the summit of a mountain, protected by a marble parapet about two cubits in height, and by brazen spikes above it." The votary who wished to enter the "cave of Trophonius," in order to consult the oracle, after preparing himself for several days previously by purification and sacrifice, lay prone on his back, and put his feet into the cave, when he was caught by some unseen force, and violently pulled inside.

TROPHY (Lat. *tropæum*, Gr. *tropaion*, from *trepo*, to put to flight—the letter *h* in the English word being an intrusive letter) was a memorial of victory erected on the spot where the enemy had turned to flight. Among the Greeks (with the exception of the Macedonians, who erected no trophies), one or two shields and helmets of the routed enemy, placed upon the trunk of a tree served as the sign and memorial of victory. After a sea-fight, the trophy consisted of the beaks and stern ornaments of the captured vessels, set up on the nearest coast. It was considered wrong to destroy such a trophy, and equally wrong to repair it, when it had fallen down through time, for animosity ought not to be perpetual. In early times, the Romans never erected trophies on the field, but decorated the buildings at Rome with the spoils of the vanquished. Of this practice, we have a familiar instance in the *rostra* or beaks set up in the forum. In later times, pillars and triumphal arches were employed to commemorate victories. Besides these, in modern times, the humiliation of an enemy is rendered lasting by such devices as the bridge of Jena, of Waterloo, and by the distribution of captured cannon. Morally considered, this practice is no improvement upon the simple and perishable trophies of the ancient Greeks.

TROPIC BIRD, *Phaëton*, a genus of birds, ranked by some in the family *pelecanidæ*, by others in *laridæ*. The bill is strong, pointed, and almost arched; the head completely feathered; the wings long; the tail short, except two feathers, which are very long and slender. Only two species are known, both tropical, and often seen very far from land. The Common Tropic-bird (*P. atherus*) is about the size of a partridge, white, with curved lines of black on the back; some of the quill-feathers black, tipped with white. It is found in the Atlantic ocean; while in the Indian and Pacific oceans, the other species (*P. phœniceus*) appears, which is of a pale rose-color, with black wing coverts, and the long feathers of the tail red. The tropic-birds breed on high cliffs.

TROPICS (Gr. turning-points or limits) are two parallels of latitude on the terrestrial globe, passing through the most northerly and southerly points on the earth's surface at which the sun is vertical. On the armillary sphere (q.v.), consequently, the ecliptic (the representation of the sun's path) touches but does not cross the tropics. The tropics include between them all those points on the earth's surface at which the sun is ever vertical. The tropic north of the equator is called the tropic of Cancer, because the sun at the summer solstice (at which time he is vertically over that tropic) enters the constellation of Cancer; and the southern one is, for a similar reason, denominated the tropic of Capricorn. The tropics are not absolutely fixed at a uniform distance from the equator, but the limits of their variation are extremely narrow. For Jan. 1, 1882, the *Nautical Almanac* gives their position in $23^{\circ} 27' 16''.60''$ n. and s. respectively.

TROP TAU, the capital of Austrian Silesia, on a tributary of the Oder, is a well-built town, 184 m. n.e. of Vienna by railway. It is the seat of the provincial government, and has a castle, cathedral, several palatial buildings, churches, and public schools, a library of 32,000 volumes, a museum of Silesian antiquities, important manufactures of machinery, cottons, linens, and beet-root sugar, and an active transit trade. Pop. '60, 16,608. A diplomatic congress was held here in October and November, 1820, which was subsequently removed to Laibach (q.v.).

TROUBADOUR (Provençal, *trobar*; Fr. *trouver*, to find, of unknown derivation). In Provençal poetry (see *TROUVÈRE*), a troubadour was a polished and cultivated poet—what the Germans call a *Kunstlicher* (art-poet)—who did not make a trade of his muse, in opposition to the musician and jongleur, who wandered about the country singing for money. Yet this distinction only gradually showed itself. At first, all classes of the community were nearly equally rude, and what pleased the peasant in the shape of song, pleased the prince also; but by degrees, a superior refinement and sensibility manifested themselves in the tastes and manners of courts, and this superiority found poetical expression in a more artistic kind of verse than had hitherto prevailed. Great nobles, princes, and kings who practiced verse-making for their pleasure, or out of chivalrous gallantry, were always called troubadours; while inferior knights, court-attendants (M.

Lat. *ministeriales*; hence *menestrels*, minstrels), and even citizens and serfs who lived by their art, or at least took money for the exercise of it, were sometimes called troubadours, and sometimes jongleurs. Under this last name were classed the musicians, singers, jugglers (a word, in fact, which is only a corruption of *jongleur*), etc.; all, in short, who did not themselves make or invent (*trobar*) poems, but only recited or chanted them, or whose business it was to accompany the singer on some musical instrument. The more celebrated troubadours had one or several such jongleurs in their service, as it was considered *infra dig.* for a poet to be his own fiddler. This new troubadour poetry (*art de trobar*), which it may be remarked was *lyric*, while the popular minstrelsy was mainly of the *epic ballad* sort, exercised a considerable influence on the advancement of literature and culture generally; yet those who practiced it never formed themselves into a guild, or into special schools, but preserved a certain free individualism, which gives a fine picturesque quality to the outlines of their history. At all the courts (great and small) in s. France, n. Spain, and Italy, they were esteemed a brilliant ornament of society; princes and fair dames (often themselves troubadours, as has been remarked) were proud of their praise, and their service of gallantry, or dreaded the biting raillery of their satiric muse; while, on the other hand, the majority of the troubadours gladly attached themselves to the court of a great prince or noble, sometimes praising their master in *sirventes* (service-songs), sometimes censuring him, but at any rate, always selecting some lady as the "mistress of their heart," to whom they, under a general or allegorical name, addressed their love-songs (*cansos*), whose cruelty they bewailed in songs of lamentation (*planhs*), or whose death they mourned in sorrowful threnodies. Although the "love-service" of the troubadours was often nothing more than an artificial gallantry, having more *esprit* than heart in it, yet not unfrequently the sport passed into fatal earnest, and adultery, murder, and revenge were the consequences.

Further, when, as often happened at great court-festivals, several troubadours were present, the latter used to indulge in competitions or verse-battles (*ensenhs*) among themselves, for the gratification of the high society assembled there; mostly on questions selected by the ladies from the "Laws of Love;" one or more of these ladies sitting as umpires at such poetic jousts, and deciding who were the victors. But although the troubadours as a rule monotonously confined themselves to themes of gallantry, yet sometimes their muse, especially in its satiric moods, ventured into higher regions, and glanced at the general conditions of society, or the graver evils of the times—as the wars between the English and French armies in southern France; the persecution of the Albigenses; the degeneracy of the clergy; the diminishing zeal for the crusades, etc.; or they even descended to depict the life of the peasantry, and sang their adventures with shepherdesses, etc., in *pastorels* and *vauqueyras*. The most illustrious patrons of the troubadour poetry were the counts of Provence, particularly Raimund Berengar III. (1167-81), Alphonse II. (1193-1209), and Raimund Berengar IV. (1209-45); the counts of Toulouse, as Raimund de St. Gilles, who joined the ranks of the crusaders in 1096, Raimund V. (1148-94), and Raimund VII. (1222-49); Richard *Cœur de Lion* of England, himself a troubadour; Eleanor, wife, first of Louis VII. of France and afterward of Henry II. of England; Ermengarde, viscountess of Narbonne; the kings of Aragon, as Alfonso II. (1162-93), Pedro II. (1196-1213), and Pedro III. (1276-85); the kings of Castile, as Alfonso IX. (1183-1229), and more especially Alfonso X. (q.v.), surnamed the Wise; several Italian princes, as Bonifacio, count of Montferrat, and after 1204 king of Thessalonica, and Azzo VII. of Este (1215-63). These names also indicate the extent of territory on which the troubadour poetry was cultivated—viz., Provence, Toulouse, Poitou, Dauphiné, or briefly France s. of the Loire; Catalonia, Valencia, and Aragon in Spain; and part of Upper Italy. It lasted for about 200 years (1090-1290), and one can distinguish three periods in its history: (1) The period of its genesis or birth, or its development out of mere popular minstrelsy into artistic poetry (1090-1140); (2) its golden age (1140-1250); (3) the period of its decline (1250-90). The first of these periods is marked by a conscious striving after something finer and more poetic than the rude simplicity of the earlier verse; the second, by the loftiest expression of ideal chivalry and gallantry, and the most perfect development of artistic form; the third, by an ever-increasing serio-didactic tendency, and a degeneracy in poetic art. Thus the poetry of the troubadours rose, and ruled, and fell with that courtly chivalry which was at once its inspiration and its soul.

The long list of troubadours begins with GUILLEM IX. count of Poitiers (1087-1127), the earliest of whom we have any knowledge, and whose verses exhibit partly the popular ballad style, and partly a more elaborate mode of poetic conception. His life and works appear to have been equally immoral—After him comes BERNARD DE VENTADOUR (1140-95), one of the first poets of the golden age of troubadour-minstrelsy. He was the son of a poor serf of the vicomte Ebles II. of Ventadour. Recognizing the talent of young Bernard, his master encouraged and assisted him; but his poetic enthusiasm was more excited by his passion for Ebles's wife, Agnes de Montluçon, than by Ebles's own commendations, and by the favor shown him by later patronesses, queen Eleanor, Joanna of Este, etc., all of whom he celebrated in fiery and delicate strains.—MARCABRUN (1140-85), a foundling, was much feared for his power of satire, and was, in fact, murdered by the castellan of Guian for an exercise of his fatal gift. He is reckoned the inventor of the art-song (*cansos*).—JAUFRÉ RUDEL, prince of Blaya (1140-70), is equally

famous for his languishing love-songs, and his romantic passion for the countess of Tripoli, whom he never saw till he was at the point of death.—PEIRE D'Auvergne (1152-1215), son of a citizen of Clermont, called himself "master of the troubadours;" yet his songs are more remarkable for their artistic finish than for their poetic inspiration.—GUILLEM DE CABESTAING (1181-96), son of a poor knight, has become famous through his tragic love for the wife of his lord, Raimon de Roussillon.—RICHARD THE LION-HEART'S song composed during his captivity in Austria, is widely known; and the songs of GUIRANT DE BORNEIL (1175-1220) have a manly and earnest ring about them; but perhaps the most celebrated of the whole fraternity was PEIRE VIDAL (1175-1215), a man wondrously endowed with poetic gifts, but who led so mad, wasteful, immoral a life, and committed such extravagant follies, that one doubts whether he was altogether sane. He was the terror of husbands.—BERTRAND DE BORN (1180-95), equally celebrated as warrior and poet, played an important part in the wars of Henry II. of England with his rebellious sons, and was a zealous French patriot. His songs are for the most part of a political cast, full of martial ardor and the love of fatherland. In his lifetime, men dreaded his sharp tongue no less than his keen sword.—FOLQUET DE MARSEILLE (1180-1231) was the son of a Genoese merchant established at Marseille. After wasting his youth in amorous gayeties, in a fit of grief for the death of one of his many mistresses, he entered the church, rose to the dignity of bishop of Toulouse, and signalized himself by the fanatical zeal with which he persecuted the Albigenses. Folquet's songs, twenty-five in number, are of an impassioned nature.—RAMBAUT DE VAQUEIRAS (1180-1207), a native of the co. of Orange, in the s. of France, was the son of a knight, and so great a favorite with Bonifacio II., marquis of Montferrat, that the latter positively tolerated his sister's intimacy with the poet. He accompanied his patron to the East, and probably fell with him fighting against the Bulgarians. Some of his songs have found their way into different Romanic tongues.—PEIROT (1180-1225), in his condition and fortunes, curiously resembled his contemporary just mentioned. His pieces rank among the finest love-songs of the troubadours.—THE MONK OF MONTAUDON (1180-1200) is a poet whose proper name is not known. He was sprung from a noble family belonging to Auvergne, and became prior of Montaudon, but, notwithstanding, led the free life of a wandering poet. Finally, he betook himself to the court of Aragon; Alfonso II. made him prior of Villafranca, where he died. He was more renowned for his satire than for his sentiment, and his songs are full of personalities directed against his brother troubadours—very cynical and very caustic.—ARNAULT DANIEL (1180-1200), a nobleman of Riberac, in Périgord, whom love made a troubadour. His powers of invention have been highly praised. Petrarch calls him *il grande maestro d'Amore*. Dante also celebrates his genius.—GAUCELM FAIDIT (1190-1240), son of a burgher of Uzerche, in Limousin, led at first, with his wife Guillelma Monja, the free and pleasant life of a jongleur; but subsequently left her, and became enamored of the countess Marie of Ventadour, who made him her troubadour. He would fain have been her paramour also, but she was too prudent; and so, to revenge himself, he carried on intrigues with other women; but his sweetest songs were those he sang in his lady's praise.—RAIMON DE MIRAVOL (1190-1220), one of the most lovable of the troubadours, although the women—his spouse not excepted, who was herself a poetess—abused him so bitterly, that for two years he was out of his mind.—SAVARIE DE MAULEON (1200-30), a French baron, became grand seneschal of Aquitania, and took part with Raimund of Toulouse against Simon de Montfort. His political career was marked by great vacillation. As a poet, he is noted for his *Tenzone*.—PEIRE CARDINAL (1210-30), son of a knight, was intended for the church, but preferred the life of a troubadour, and traveled with his jongleur from court to court. Jago I. of Aragon was his great patron. He was a master of the moralistic *Sirventes*, and assailed—but only with a sort of generalized satire—the nobles and clergy.—The last representative of the troubadours was GUIRAUT RIQUIER (1250-94), a native of Narbonne. Although he had in his time many patrons, of whom the most distinguished was Alfonso X. of Castile, he was often in sore need; and his poems, full of complaints of the disrepute into which his order had fallen, may be regarded as the swan-song of troubadour poetry.—See Diez, *Leben und Werke der Troubadours* (Zwickau, 1829); Fauriel, *Histoire de la Littérature Provençale* (3 vols., Par. 1846); Galvani, *Osservazioni sulle Poesie de' Trovadori* (Modena, 1829), and *Fiore di Storia letteraria e cavalleresca della Occitanità* (Milan, 1845); De Laveleye, *Histoire de la Langue et de la Littérature Provençale* (Brüss. 1845); Mahn, *Die Werke der Troubadours* (Berl. 1846); and *Die Biographien der Troubadours* (Berl. 1853); Brinckmeier, *Blumenlese aus den Werken der Troubadours* (Halle, 1849), and *Rügelieder der Troubadours* (Halle, 1846); Kannegiesser, *Gedichte der Troubadours* (Tüb. 1852), and *Ungedruckte Provenzal. Lieder* (1853); Bartsch, *Grundriss zur Geschichte der Provenzalischen Literatur* (1872); Bayle, *La Poesie Provençale au Moyen Age* (1876).

TROUP, a co. in w. Ga., bordering on Alabama; 370 sq. m.; pop. '80, 20, 566—20,521 of American birth, 13,974 colored. Co. seat, La Grange.

TROUP, GEORGE MCINTOSH, 1780-1856; b. near the Tombigbee river, Ala.; graduate of the college of New Jersey, 1797; studied law; resided in Georgia; member of the legislature, 1800-3; member of congress, 1807-15; U. S. senator, 1816-18 and

1829-34; governor of the state, 1823-27. He was a popular speaker of extreme views in regard to state rights and state sovereignty, and with principles of unswerving integrity.

TROUP, ROBERT, LL.D., 1757-1832, b. N. Y.; studied law, but in 1776 joined the revolutionary army as lieutenant. After the battle of Long Island he was confined in the Jersey prison-ship, and after his exchange became aid to general Gates, and was in the battles of Saratoga and Stillwater and at the surrender of Burgoyne. In 1778 he was made secretary of the board of war. After the war he was a member of the N. Y. legislature, and a judge of the U. S. district court.

TROUSDALE, a co. in n. Tennessee, formed in 1870; intersected in the s. by the Cumberland river; the smallest county in the state; 110 sq. m.; pop. '80, 6,646—6,635 of American birth, 2,141 colored. Co. seat, Hartsville.

TROUS-DE-LOUP, or **WOLF-HOLES,** are hidden holes about 6 ft. deep, and 4½ in diameter at the top. They are funnel-shaped, and have one or more pointed stakes at the bottom. They are placed often thickly about the glaciers and approaches to a fortress; the object being to break the ranks and otherwise disorganize an attacking force.

TROUT (Fr. *truite*, from M. Lat. *tructa*, which, according to Diez, may be from Gr. *troktes*, the name of a voracious sea-fish, derived from *trogo*, to eat), the popular name of many species of the genus *salmo*, as characterized by Cuvier, some of which are referred by Valenciennes to his restricted genus *salmo*, some to *fario*, and some to *salar*. See **SALMON**. The name is given to some of the silvery species, migrating to the sea, and to all the yellow species, which constantly inhabit fresh waters. The former are noticed in the article **SALMON**; the present article is devoted to the latter.

Trouts are found in almost all the lakes and rivers of the temperate and colder parts of the northern hemisphere. The **Common Trout** (*salmo fario* or *salar Ausonii*) is widely diffused in the eastern hemisphere, abounding in almost all the lakes and rivers of the British islands and the n. of Europe. It is found even in very small streams, and almost to their mountain sources, but attains its largest size where there is considerable depth of water and abundance of food. An instance is on record of a trout caught in England, in a branch of the Avon at Salisbury, weighing 25 lbs.; but such a size is very rare, and even in ponds where the trout are regularly fed, they seldom exceed 10 lbs. A trout of 1 lb. or 1½ lbs. is reckoned by the angler a very fine fish; and many a stream swarming with trout produces none nearly so large. The head of the common trout is large; the eye large; the general form symmetrical, stouter than that of the salmon, the convexity of the outline of the back nearly similar to that of the belly; the tail is slightly forked, except in old fish, in which it becomes almost square, and sometimes even slightly convex. The teeth are numerous, strong, and curved; two rows of them extending along the whole length of the *vomer*, with no marked group at its front. The color is more or less yellow, but the tint varies much in the trout of different waters, sometimes passing into greenish black or violet. The color is brightest in the trout of clear streams. On the back and upper part of the sides there are numerous spots of black and red; the belly is silvery white. The spots on the sides vary much. The fins are light brown; the dorsal fin and tail with numerous darker brown spots. The varieties which the common trout exhibits in tints and spots has led to the supposition that several distinct species have perhaps been confounded as one, and attempts have been made to point out their characters; but these have not proved satisfactory to the greater number of naturalists. It is certain that the appearance of the trout is much affected by the character of the water in which it lives, and the food with which it is supplied. The trout of a river with a muddy bottom are very different from those of a clear stream, and those of a stream darkly colored by moss are easily distinguished. The tint of the flesh varies as well as the external colors, being pink in some—the finest for the table—and white in others. It has been found that trout transferred from one locality to another soon change their tints.

The trout is very voracious, and readily devours almost any kind of animal food. Worms and slugs washed into rivers by rains are very acceptable to it. Small crustaceans are supposed to be the chief food of trout in some lakes and streams which are noted for the excellence of their produce. Small fresh-water shell-fish are also a favorite food of trout. Small fish of any kind which they can capture are their prey, and multitudes of salmon-fry thus perish. A gentleman well known to the writer of this article caught a large trout which had a very young viper in its mouth, bitten into three pieces; not yet swallowed, probably, because there was not room for it in the over-gorged stomach. The leaping of trout for flies in a summer day or evening adds to the charm of many a rural scene. Small trout often throw themselves quite out of the water; the larger ones in general merely rise to take struggling flies from its surface. The angler adapts his lures to the season and the weather. In spring and summer, when the weather is fine, the artificial fly is very successful: bait, generally the worm, is used in wet weather, or when the streams are much swollen by rains. The minnow is a good bait for large trout. No bait is more deadly than salmon roe, but the use of it is prohibited by law in Britain, for the sake of the salmon fisheries.

The trout generally spawns in the end of October, when the lower jaw of the male becomes elongated but not so much as in the salmon. The spawn is deposited in the same manner as that of the salmon, in gravelly beds, in running streams; and the trout

of lakes ascend streams for this purpose. Where trout have no access to proper spawning-ground, recourse must be had to artificial means to increase the stock (see PRISCULTURE); but in many small streams their numbers seem incapable of being diminished by any amount of angling. The best feeding-grounds are often where there is no good spawning-ground within reach of the fish. The trout grows rapidly when it has abundant food. From instances of individuals kept in wells and ponds, it is known to attain an age of 30 or even 50 years.

Among the varieties of the common trout, one called the GILLAROO TROUT is found in lough Neagh and other lakes of the n. of Ireland. It attains a large size, is very thick in proportion to its length, and has much smaller teeth than the ordinary trout.

The LOCHLEVEN TROUT (*salmo Levenensis* or *S. cæcyfer*) is found in Lochleven in Scotland, where the common trout is also found, and is distinguished from it by the more pointed pectoral fins; the much longer rays of the tail-fin, which is also more pointed at its extremities; and particularly by the number of the caecal appendages, which are from 60 to 80 in the Lochleven trout, while they do not exceed 46 in the common trout. The flesh of the Lochleven trout is not white or pink, but red. It attains a large size.

The GREAT LAKE TROUT (*salmo ferax*) is the only other British species. It is found in some of the larger British and Irish lakes, and in the lakes of Scandinavia, seldom, if ever, ascending rivers, except for a short distance at the spawning season. It attains a size of almost 30 lbs., is a very powerful, active fish, and ties the skill of the angler in no small degree. It differs from the common trout in the longer muzzle, in the position of the fins, in having the tail square in all stages of growth, and in other characters. Its color is generally deep purplish brown, passing into greenish or grayish-yellow on the belly. The spots are large, and not numerous. The great lake trout feeds much on small fishes, and is as greedy as a pike. It is taken by night-lines, or by trolling with strong tackle and a small trout or other small fish for bait. Young fish are taken with the artificial fly. The flesh of this species is very inferior in quality to that of the common trout.—Very different from it is the LAKE TROUT of the lake of Geneva (*salmo* or *fario Lemanus*), which is a fish of excellent quality, and nearly allied to the salmon trout. See SALMON. It ascends the rivers which fall into the lake, as the salmon trout ascends rivers from the sea.

North America has numerous species of trout. One of them, the COMMON BROOK TROUT, or SPECKLED TROUT (*salmo fontinalis*), is so similar to the common trout of Britain, that it may also be regarded as a variety rather than as a distinct species. It abounds in the streams of Canada and the more eastern British provinces, and in the northern and middle parts of the United States.—The NORTH AMERICAN LAKE TROUT (*salmo confinis*) inhabits the deepest waters of the great lakes, and sometimes attains a weight of more than 60 lbs. It is dark-colored, mottled with grayish spots. Its flesh is dirty yellow, and of very poor quality. It never takes the fly, but may be caught with the minnow, or a bait of fat pork. It is more sluggish than its congeners, and affords poor sport to the angler. There are several species of lake trout in North America. The finest in quality, as well as largest in size, is the MACKINAW TROUT or NAMAYCUSH (*Salmo amethystus* or *namaycush*). It is not found in lake Erie, nor in lake Ontario, but in lake Huron, lake Superior, and the more northern lakes, even in those of the arctic regions. It inhabits the deepest parts of them, except in autumn, when it resorts to shallow water for spawning.—The SISKIWIW TROUT (*salmo* or *salar eisewinet*) of lake Superior is of large size, stout, thick, and of rich flavor, but so fat as to be almost unfit for food.—The RED-BELLIED TROUT (*salmo* or *fario erythrogaster*) of the lakes of New York and Pennsylvania, sometimes 2½ ft. in length, is deep greenish on the back, lighter on the sides, which are spotted with red, the belly orange red.

The n.w. of America has its own peculiar species of trout, one of which, the OREGON TROUT (*salmo Oregonensis*), is found in almost every stream from the snowy peaks of the Rocky mountains to the sea, and is very similar to the common trout of Europe.

TROUVÈRE, the name given in n. France to the same kind of courtly or polished poet who, in s. France, etc., was called *tronbadour* (q.v.). Like the latter, he was usually attended by a *jongleur*, whose business it was to furnish an instrumental accompaniment to the songs which his master composed and sung. Sometimes but rarely, the *trouvère* himself played on a harp. On the other hand, if minstrels and *jongleurs* were ambitious enough to aspire to original composition—as was the case, for example, with Adenez le Rois, Raymbert de Paris, etc.—they were nicknamed “Bastard Trouvères” (*troveor bastart*), or “interloping rhymers” (*contrerimeours*). This disdainful feeling of superiority was none the less likely to be strong that the poetry of the *trouvères* was high in favor at the northern courts, and that even kings and nobles were proud of the “accomplishment of verse.” Among these princely and patrician amateurs were Thibaud of Champagne, king of Navarre, Jean de Brienne, Charles d’Anjou, Henri III. of Brabant, Pierre de Dreux, count of Brittany, etc. The great patrons of the *trouvères* were the kings of France and England, the dukes of Brabant, the counts of Champagne, Flanders, etc.; while by the Anjou dynasty of the kings of Naples, their art was carried into s. Italy, and by Henry of Burgundy into Portugal. The number of *trouvères*, in consequence, grew to be considerable; and one can still reckon the names and works of more than 150, of whom perhaps the most celebrated is the Cas-

tellan de Couey.—See *De la Rue, Essais Historiques sur les Bardes, les Jongleurs et les Trouvères Normands et Anglo-Normands* (3 vols., Caen, 1834); Dinaux, *Trouvères, Jongleurs et Menestrels du Nord de la France et du Midi de la Belgique* (3 vols., Par. 1837-43); Paris, *Le Romancier Français* (Par. 1833); Wackernagel, *Altfranz. Lieder* (1846); Mätzner, *Altfranz. Lieder* (1853); Bartsch, *Altfranz. Romanzen* (1870); Scheler, *Trouvères Belges* (1876).

TRO'VER, in the law of England, is an action brought to recover goods from a person to whom they do not belong, but who has in some way obtained possession of them. It was founded on the old fiction, that the rightful owner had accidentally lost the goods, and the party in possession had found them, and would not give them up to such owner. It is practically an action to try the title to the goods, and therefore is of extensive application in the law of contracts, as well as other branches of law. The plaintiff, if successful, recovers the value of the goods as a satisfaction. The defendant is said to have illegally converted or appropriated the goods, and it is by the conversion of the goods that the damage is done, and for which the remedy is given.

TROWBRIDGE, a market t. of Wiltshire, stands on a rocky eminence in the valley of the river Biss, 10 m. s.e. of Bath. In the church of St. James, which dates from the 14th c., Crabbe the poet officiated as clergyman from the year 1814 to 1832, and his remains repose under a monument in the chancel. The town has long been the seat of woollen manufactures, and these within recent years, have been carried on with much spirit and success. Cassimeres, kerseys, tweeds, and woollen cloths of the best qualities are manufactured. Many handsome villas have been erected outside the town by the wealthy manufacturers. Pop. '71, 11,508.

TROWBRIDGE, EDMUND, 1709-93; b. Mass.; graduated at Harvard, 1728. He was called to the bar, where he rose to eminence. He became attorney-general of the state in 1749, was a member of the council, and in 1767 was appointed chief-justice. His attitude in regard to the disputes between Great Britain and the colonists was too judicial to suit the latter, and he resigned from the bench in 1772.

TROWBRIDGE, JOHN TOWNSEND; b. N. Y., 1827; settled in Boston in 1847, and became a writer for the press and of stories. Among his many works are *Neighbor Jackwood* (1857); *Cudjo's Cave* (1864); *The Three Scouts* (1865); *Neighbors' Wives* (1867); *First Friends* (1874); *The Young Surveyor* (1875); and *The Book of Gold and other Poems* (1879).

TROWBRIDGE, WILLIAM PETIT; b. Mich., 1829; graduated at West Point, 1848, standing first in his class. He was assistant in the astronomical observatory of the academy, and was soon appointed to service on the coast survey; in 1852 had charge of the triangulation of the coast of Maine and did similar work in Virginia. In 1853 he began tidal and magnetic observations on the Pacific coast, and was occupied about three years in the duty. In 1856 he resigned his commission and accepted a professorship in the university of Michigan, but soon again became prof. Bache's assistant in the coast survey. During the rebellion his scientific attainments were of great value in the construction and repairing of forts and bridges, and he had charge of the New-York branch office of the engineer department. After the war he was connected for some time with the New York Novelty iron works, but in 1870 accepted the professorship of mechanical or dynamic engineering in the Sheffield scientific school of Yale college, which position he still holds. He is the author of a work on *Steam Generators*.

TROY. The earliest traditions of the Greek people, as contained in their oldest poetry and history, represent the country on both sides of the Ægean as peopled by various races, either of genuine Hellenic, or of closely affiliated tribes. Among those who peopled the eastern or Asiatic coast are specially named the Pelasgi, the Leleges, the Caucones, the Carians, the Lycians, and the Trojans. These last, to whom Homer's poem has given a celebrity that throws all the rest into the shade, occupied the small country in the n.w. corner of Asia Minor, best defined, perhaps, as the region of mount Ida, with its topographical dependencies. That the Trojans were either a Greek race, or some non-Hellenic people under a Greek dynasty, seems probable, from the absence in Homer of any such decided national contrast between Greeks and Trojans, as we find in mediæval poetry between Christians and Saracens. Local legends represented them as closely connected with Crete; and Homer in the *Iliad*, xx., makes Priam the sixth in descent from Dardanus, the first of the dynasty, who was supposed to have come from Crete. The story of the Trojan war, which forms the subject of Homer's great poem the *Iliad*, is extremely simple. The Trojans, in the person of Paris, or Alexander, the son of the reigning monarch, Priam, are represented as having had certain dealings with the Achæans, or Greeks of the Peloponnesus, in the course of which the gay young prince carries off from the palace of Menelaus, king of Sparta, his spouse Helen, the greatest beauty of her age. To revenge this insult, the Greeks banded themselves together, and sailed against Troy with a large fleet. All the Greek tribes afterward famous in history took part in this expedition; but the most notable were the Argives or Achæans—Greeks of the e. and n. part of the Peloponnesus, and adjacent isles; the Spartans—Greeks of the s.e. district of the Peloponnesus; the Neleids—Greeks of the w. coast of the Peloponnesus; the Boeotians, and the Thessalians. Of the Thessalians, the most prominent captain was Achilles; and the

general command of the whole expedition was committed to Agamemnon, king of Mycenæ, as the head of the most numerous contingent, and at the same time the brother of the royal person whose hospitality had been so grossly violated. This well-appointed European army is represented as having spent nine years in besieging the god-built walls of the city of Priam without making any impression on its strength. A violent quarrel between Achilles and Agamemnon, breaking out in the tenth year, so weakened the invading force that the Trojans, under Hector, pushed the Greeks back to the very verge of the sea, and almost set their ships on fire. This quarrel forms the subject of the *Iliad*. At the critical moment, however, the Thessalian captain is reconciled to the head of the expedition; and with his return to the field, the fortune of war changes; Hector, the champion of Troy, falls, and the impending doom of the city is darkly foreshadowed. The siege and sack of Troy did not fall within the plan of Homer's poem, but are narrated at length in the *Post Homericæ*, a Greek poem by Quintus Smyrnaeus, a poet of the decadence. The Greeks possessed a long series of popular poems called the *Cyclic poems*, in which the whole sequence of the Trojan story was narrated, giving completeness to the brilliant fragment, which has been adorned by the genius of Homer. From these poems—of which the abstracts are still preserved—Virgil derived those materials which he has used with such effect in the second and third books of his great poem. The *Cyclic poems*, besides the events in the Trojan war after the death of Achilles, contained an account of the various colonies in Italy and elsewhere believed to have been founded by the scattered chiefs of the expedition after their return home. Of these, the settlements of Diomedes, Philoctetes, and Indomeneus, on the s.e. coast of Italy, and that of Æneas on the banks of the Tiber, are the most famous. The chronology of the Trojan war, depending as it does mainly on artificial construction from genealogical data, is not, of course, trustworthy; but there are good reasons for believing that the generally received date 1184 B.C. is not far wide of the mark. After the fall of the kingdom of Priam, the future story of Troy is short and uneventful. Under the Lydian kings, whose dynasty culminated in Croesus, a new Troy—*Ilium Novum*—began to creep into notice, which, from the glory that belonged to its name, and the favor of Alexander the great, Julius Cæsar, and other influential visitors, grew into some significance. The interest which attached to it, however, in its most flourishing estate was more antiquarian than political.

How far the events of the Trojan war, as found in Homer and the *Cyclic poems*, are to be taken as historical, depends upon the view which is taken of the general character of the materials of popular ballad poetry in all countries. That there is in the general case an under-stratum of historical reality, out of which the earliest popular poetry grows, may be assumed as certain. But how strong the tendency is, in early uncritical ages, to erect on this foundation a purely imaginary superstructure, need scarcely be mentioned. At the same time there is a very great difference to be observed in the popular poetry of different nations, in respect of the greater or less amount of trustworthy historical matter which lies embedded in the imaginative conglomerate. The excess of the imaginative, fanciful, and altogether improbable element is found in our own Arthurian and Carolingian romances. In Homer, on the other hand, there is a sobriety of tone, a geographical clearness, and a general air of verisimilitude, which incline the reader to accept the historical reality of the main facts. In the first chapter of Herodotus we find the Phenicians practicing the very same act of abduction, though in a more violent form, which the poet represents as having kindled the famous ten years' warfare between Greece and Troy; and, even in the most general view, the war of Troy between rival peoples on the opposite sides of the Ægean may be looked on as the natural overture of those great struggles, by which, on the same theater afterward, the fate of the world, indicated by the preponderance of the European over the Asiatic element, was more than once decided.

The PLAIN OF TROY is formed by the débris of the great chain of mountains which terminates the peninsula of Asia Minor on the n.w., where it is separated from Europe by the sea of Marmora and the narrow strait of the Dardanelles. This chain of mountains is called Ida by Homer (*Idæ*, wood); and its highest peak toward the s. side of the Troad, overhanging the bay of Adramyttium, is celebrated by the same poet as Gargarus. Westward from this chain the land slopes gradually down by a series of undulating ridges to the s. coast of the Dardanelles. The plain included between these ridges and the sea is the plain of Troy. It is surrounded on all sides by elevated ground, by hills and mountains toward the e. and s.e., and by rocky ridges or cliffs along the coast. At one place only does it open to the sea, and this is at the extreme n.w. corner, where it meets the s. end of the Dardanelles. Here there is a stretch of sandy shore about two m. in length, beginning behind the Turkish fort of Koumkale, and trending eastward. This is the only place where a fleet such as that described in the *Iliad* could effect a permanent landing; and here, accordingly, by general consent, the encampment of the Greeks is placed. The promontory which bounds this bay to the e. is universally acknowledged as the Rhætan promontory of the ancients, while that on the w. is the Sigeon. Here, also, as the natural mouth of the plain, the principal river, by whose action mainly it was formed, finds its way into the sea. This river is the Menderes, obviously a corruption of the Homeric Scamander, called also, by the poet Xanthus, from *xanthos*, that is, the *yellow* river, from the color of its waters; a quality which has

been noticed by most modern travelers. Looking up the plain from any of the heights about the mouth of the river in a south-easterly direction toward Gargarus, its course can easily be traced to a distance of about nine m., where it emerges into the plain through a defile in the mountains. This distance of nine m., therefore, is the extreme length of the plain of Troy. Its breadth is about three miles. It presents the appearance of "a long tract of meadow-land, inclosed within a girdle of low, round-backed hills, and prettily garnished by many lines of trees, which skirt the water-courses." These waters, with the single exception of the Scamander, are not large enough, according to our usage, to deserve the name of rivers, but are mere mountain-torrents or brooks, generally dry in summer, some of them nothing better than a sort of natural drains or ditches. Those deserving of mention are three: the first flowing from the chain of Ida westward into the plain, about three m. from the sea, called the *Dombrek*; the other in the same direction, about five m. further up, called the *Kimair*. The third streamlet rises at the head of the plain, near the Turkish village of Bunarbashi, and creeping along the bottom of the slope toward the Archipelago, forms the boundary of the plain on the w., and empties itself into the Mendereh, about two m. above its mouth. One of these streams must be the Homeric Simois.

The topography of a plain so famous in the history of human civilization has, of course, occupied the attention of the learned both in ancient and modern times; and a considerable library could be formed of volumes in which this region has been described, and its most famous localities discussed. The topographical result of these voluminous discussions can, however, now be given in a very few sentences. In the first place, after seventy years of confusion and hallucination, it may be regarded as certainly established, that the Mendereh is the Scamander. It is also universally allowed that *Novum Ilium*, or New Troy, occupied the site of Hissarlik, on an eminence about four m. from the mouth of the river, on its right bank, near the bend of the *Dombrek*. It is also a matter of general consent, that the great tumulus or barrow, near the Sigeon promontory, where the Dardanelles broaden up into the wide *Ægean*, is the veritable monument of Achilles, described by Homer in a famous passage of the *Odyssey*; but beyond these three points, it cannot be said that any part of the classical topography of the plain has been ascertained with certainty. The great point to determine, of course, is the site of the Homeric Troy, the capital of the empire of Priam; but this is a matter which, in default of inscriptions, can be ascertained only by previously deciding which of the three streamlets above mentioned is the true heir to the legendary glories of the Homeric Simois; for between the Scamander and the Simois the tide of battle rolled to and fro, as Homer expressly tells us; and at the head of the plain between these two rivers the town of Troy must certainly stand. Those who hold with Strabo among the ancients, and Maclaren among the moderns, that the *Dombrek* is the Simois, have strong grounds for maintaining that New Troy was built upon the site of Old Troy, and that no further search is necessary; while they who look on this point as suspicious, must recognize the Simois in the river of Bunarbashi, and the site of the Pergamus of Priam on the plateau at the great bend of the Scamander, about a m. to the eastward of the village of Punarbashi, where the substructions of an ancient city have been lately excavated. Those who wish to see this nice topographical question discussed in the most masterly style, will read *The Plain of Troy Described*, by Charles Maclaren (Edin. 1833), on the one side; and *Ueber das Homerische Ilium*, by prof. Welcker, in his collected tracts (Bonn, 1845), on the other. A succinct exposition of the arguments on both sides will be found in prof. Blackie's notes to the *Iliad*, Book xxi. The literary history of this topographical question, commencing with the work of Le Chevalier, a Frenchman, translated into English by prof. Dalzel in 1791, is extremely curious; but the most distinguished scholars and topographers being now agreed that the Mendereh and the Scamander are identical, it is not necessary to make any allusion to the wonderful discovery of "the wells of the Scamander," by which Le Chevalier imagined he had made himself immortal. Dr. Schliemann, who lately carried on a systematic investigation of the supposed neighborhood of ancient Troy, believes he has found, at Hissarlik, its veritable site. In July, 1872, he discovered a very large collection of gold, silver, and copper implements and weapons, undoubtedly of great antiquity. He considers that these are part of the treasures of ancient Troy, probably buried for safety on the night of the conflagration. See his *Trojan Antiquities (Trojanische Alterthümer, 1872)*.

TROY, a city of New York, on the e. bank of the Hudson river, at the head of steamboat navigation and tide-water, 151 m. n. of New York city, and 6 m. n. of Albany, built upon the alluvial flats of the river and hills, called mount Ida, on the e. side. Winants Kill and Poesten Kill, two small streams, having such a series of falls, furnish water-power to mills and factories, besides that given by a dam across the Hudson. At Troy is the principal outlet of the canals connecting the Hudson with lakes Champlain, Ontario, and Erie; and it has railways diverging in all directions, connecting it with New York, Boston, etc. The Union depot, in the center of the city, is one of the largest in America, 60 trains arriving and departing daily. The iron furnaces and manufactories are the largest e. of the Alleghanies, being furnished with the magnetic ores of lake Champlain, and the hematitic ores of western Massachusetts. The coal is brought from Pennsylvania and Maryland. The chief iron-works are those for

bar-iron, railway-spikes, nails, locomotives, stoves, hot-air furnaces, hollow ware, machinery, agricultural implements, etc. Other important manufactures are those of railway cars, coaches, omnibuses, cotton and woolen goods, breweries, distilleries, flour, boots and shoes, shirts and collars—the latter employing 6,000 persons, with extensive machinery. There is also the largest manufactory of mathematical instruments in the country. The property which reaches tide-water by the canals centering at Troy, including lumber, is valued at 17,000,000 dollars annually. The city contains 56 churches, public schools with an annual enrolment of 8,000 pupils; the Rensselaer polytechnic institution, with 14 teachers and 170 students; a Roman Catholic seminary; a-y-lums, academies, etc. Troy was settled by the Dutch in 1752, and incorporated as a village in 1801. Three times it has been nearly destroyed by fire; in 1862, the loss amounted to 3,000,000 dollars. Pop. '40, 19,334; '50, 28,785; '60, 39,295; '70, 46,465; '75, 48,821.

TROY (*ante*), a city in the state of New York; pop. '80, 56,747; capital of Rensselaer co.; at the confluence of the Hudson and Molawk rivers. Its manufactories are among the most important and prosperous in the country. Here were established the first Bessemer steel-works in America, and its rolling-mills, blast-furnaces, and foundries are enormously productive. It does also the largest business in the manufacture of shirts and stoves of any city in the United States. It is connected with West Troy by a fine iron bridge, which cost \$250,000; and this suburb may be considered practically a portion of the city. Here is the great Watervliet arsenal, which comprehends all the necessary work-shops, and is surrounded by handsome grounds. Here are also a noted bell-foundry, and other considerable industrial establishments. The railroad connections are by the Troy and Boston, the Rensselaer and Saratoga, and the New York Central and Hudson river railroads. Horse railroads connect Troy with the neighboring towns of Cohoes, Lansingburg, and Waterford. Situated on a high bluff, and overlooking the beautiful Cohoes falls, is Oakwood cemetery, beautiful naturally and artificially; here lie the remains of maj. gens. George H. Thomas and John E. Wool. Troy is a well administered city, has a paid fire-department in excellent condition, with an electric fire alarm; its charitable and educational institutions are numerous and well-conducted; and its general progress is steady and satisfactory.

TROYES, a t. of France, formerly capital of the province of Champagne, and now of the department of Aube, on the left bank of the river Seine, 103 m. e.s.e. of Paris by railway. It is a very old-fashioned place, and most of the houses are of wood. The principal buildings are the cathedral, dedicated to St. Peter, a splendid specimen of *flamboyant* Gothic, founded in 872, and rebuilt between the 13th and 16th centuries; the churches of St. Urban, the Madeleine, St. Pantaleon, and St. Remi, the Hôtel de Ville, a public library, containing 100,000 vols. and 5,000 MSS.; a museum, the palace of justice, the exchange, merchant's hall, and various educational institutions. Troyes is not so populous or important as it was in the middle ages. Even as late as Henry IV.'s time, it had more than 60,000 inhabitants; in 1876, the pop. was 41,275. It carries on numerous cotton and woolen manufactures, and, as the center of a rich agricultural region, it has a large transit-trade.

Troyes, anciently the capital of the Celtic Tricassii, was called by the Romans *Augustobona*; later, *Civitas Tricassium*; and then *Trece* (a corruption of Tricassii), whence the modern Troyes.

TROYON, CONSTANT, 1813-65; b. Sèvres; first employed as decorator of china in the porcelain works; became an eminent painter of landscapes and animals; began to exhibit, 1833, and was soon afterward presented with medals of the first-class, and acquired an immense fortune. His "Vallée de la Tongue" first brought him into notice. He painted pictures illustrating St. Cloud and Sèvres, which gained the popular favor. His "Osier Bed" sold in Paris for 24,200 francs; his "White Cow chased by a Dog," 10,400 francs; and "Pastures near Trouville," 1200 francs. "Before the Storm" is among the most celebrated of his works.

TROY-WEIGHT. The origin of the term "troy" is unknown; some consider it to be a corruption of *le roy*, as the troy pound was, till recently, the standard pound (*pondus regis*); some derive it from *Troy novant*, the monkish name for London; while the majority of philologists and lexicographers profess to see the origin of the name in the town of Troyes, in France, an important center of commerce during the middle ages, which hence *may*, like the towns of Cologne, Toulouse, and others, have had its own special system of weights; though why the term should have migrated to Britain, and been exclusively employed there for so long, is not at all evident. A troy pound (of what value is unknown) is first mentioned in Britain in 1414, long before which period the standard pound of 12 oz., as well as another pound (the tower pound) of 12 oz., was in use. The term "troy" was first applied to the standard pound in 1495, but at the same time no change seems to have been made in its value, and it continued, as before, to be exclusively employed by the dealers in the precious metals, gems, and drugs. See POUND. The troy pound contains 12 oz., each ounce 20 penny-weights, and each penny-weight 24 grains; thus the pound contains 5,760 grains and is to the avoird. pound as 144 to 175; while the troy ounce is to the avoird. ounce as 192 to 175. For medicines other subdivisions of the troy pound were formerly employed; but now medicines are weighed by the avoirdupois standard (q. v.). The old English pound, to which the term

troy was afterward employed, was doubtless the pound of silver; and the tower pound of 12 oz. differed from it only by $\frac{1}{4}$ of an ounce.

TRUCE, a suspension of hostilities between two armies or states for a period specially agreed upon. During a truce it is dishonorable to occupy more advanced ground or to resort to any act which would confer advantage. A truce requires ordinarily to be confirmed by the commander-in-chief to become binding. It is lawful to break it before the prescribed period, on notice previously agreed on being given to the opposite party. This is called denouncing a truce.

TRÜBNER, NICOLAS, b. Germany, 1817; removed to London, where he became the head of the publishing house of Trübner & Co. He has published a translation of Conscience's *Sketches from Flemish Life* (1845), and a *Bibliographical Guide to American Literature* (1855). He is a good oriental scholar, also familiar with Basque.

TRUCE OF GOD. See God's TRUCE.

TRUCK-SYSTEM (French *troquer*, Scotch *trock*, to barter or exchange) is applied to the practice of paying workmen in goods instead of current money. There is no question about the bad social influence of such an arrangement in the ordinary staple and steady systems of productive industry, though there are cases where it is beneficial—as where new works bringing together large bodies of men are started in districts where there is little or no traffic. In such cases an arrangement to supply the workmen from temporary stores established by their employers, or by persons in communication with them, will be better than leaving the families so collected at the mercy of miscellaneous speculators, probably insufficiently supplied with capital. The truck act of 1831 (1 and 2 Will. IV. c. 37) imposes penalties on the employer who pays in goods in certain producing trades. The feature which was supposed to be the supreme triumph of the act, however, and was to make it self-working, was that all wages so paid were to be a blank. The workman so remunerated had still an action for his wages, and in various shapes it was provided that the goods should be no "set off" against the money value of the labor. The report of a select committee appointed in 1842 to inquire into the extent and operation of the truck-system, found that, notwithstanding the act, it flourished extensively in several productive trades—as in coal and other mines, iron-works, quarries, and various kinds of manufactories; and they reported that its prevalence had a very pernicious effect on the families of the working-men. In the year 1853 Mr. J. H. Burton was employed by government to investigate the system as it operated in Scotland; and his report of the results was presented to parliament. He found that, however pernicious it might be, it was a thing beyond legislative control, and that the attempts to suppress it in many cases only strengthened its hold, by the completeness of the organization for carrying it out. One, and a perfectly simple form, is this. At a large iron-work, say, the stated payment of the men is monthly. From their improvident habits, however, they are ever requiring advances. These are at once paid in cash. There is at the same time a neighboring store; it may be owned by the same proprietors as the iron-work, or it may be let to some other person at a rent estimated, not at the value of the premises in the market, but at that of the trade which is guaranteed to the tenant. At this store all purchases are made in cash, and all comers may purchase as at any other shop. The books of the two establishments, however, show how much of his advances each workman has expended at this store. A man says he wants a pound in advance of his monthly wages. He gets the money and no questions are asked. By comparison of books, however, it comes out how much of this is spent in the store. When he asks another advance it may be refused, for reasons known to both parties, but not told. In some instances the registers are so complete that when the workman pockets his advance he knows, though he has never been told, what proportion of it he must spend at the store to keep in the advanced pay-list. It was found not unusual to limit the free expenditure to 5 per cent, or a shilling in the pound. Thus the system has its foundation in the improvidence of the class it affects. Until that disease is cured and the workman can wait for the periodical pay-day, he must take his advances on the employer's conditions. As a general economy the truck-system does not pay. If it is supposed to be profitable it is from the fallacy that two profits may be made on one capital. The capital which the iron-master devotes to dealing in beef, tea, and beer must be subtracted from the capital embarked in his iron-work. This is the business to which he professes to devote himself, and for which he believes himself to have peculiar faculties. His truck-shop either diverts his attention from his main business, or he must hand it over to a hireling, who certainly will not work the capital so embarked as profitably as that portion employed in the iron-work, and superintended by the owner himself. But in great trade where truck is the established rule the individual employer cannot help himself. The rate of wages is adjusted on the scale of a portion coming back in the shape of the profit on purchases at the shop. The employer must therefore keep a shop, unless he can get his men to be so reasonable as to work for him on less wages than their neighbors nominally get; but he would be a person of miraculous reasoning powers who would persuade working-men to do that.

TRUE CROSS, or HOLY ROOD, **THE**, said to have been discovered at Jerusalem, 326 A.D., through the exertions of Helena, the mother of Constantine, who had determined

to commemorate his conversion by building a church on the spot where the cross of Christ had stood. Helena went to Jerusalem, had the whole place cleared and extensive excavations made. The holy sepulcher was discovered, as was claimed, the three crosses found, with the nails, and the tablet of inscription, not, however, attached to any of the crosses. A noble lady of Jerusalem, sick unto death, touched two of them without effect; but, touching the third, was healed. Part of this cross having been framed in silver and placed in the new church, splinters of it were soon extensively sold. Yet, although "the whole world was at length filled with these splinters, the cross itself miraculously remained entire."

TRUFFLE, *Tuber*, a genus of fungi of the section *gasteromycetes*; globose, or nearly so; of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine veins, which are the *hymenium*, and bear the spore-cases in minute cavities. The species are not numerous; they are very generally diffused in temperate parts of the world; they are subterranean, often found at the depth of a foot or more in the soil. Some of them are among the most highly valued of esculent fungi. The COMMON TRUFFLE (*T. cibarium*) is of a black color, and has a watery surface. It varies in size from that of a large plum to that of a large potato. On account of its agreeable flavor, it is used in the preparation of many dishes. It is common in the central and southern parts of Europe, chiefly in loose soils, in woods and pastures, as in the chestnut woods of France and Italy. In England, it occurs, pretty abundantly, in the downs of Wiltshire, Hampshire, and Kent. Other species, as *T. aestivum*, *T. rubrum*, and *T. moschatum*, are found in some parts of France, Italy and other countries of Europe, and are sought after and used in the same manner as the common truffle. It has recently been discovered that the English species are more numerous than was formerly supposed; truffles have also been discovered in localities in the s. of England where their existence was formerly unknown. The gathering of truffles is the occupation of many persons in the places where they abound. They are dug up with a kind of hoe or pick. Dogs are trained to seek them, and readily discover by the scent the spot where they grow underground. The stirring of the soil in the gathering of truffles seems to increase its productiveness. No particular kind of dog is specially employed for truffle-seeking; but one of which the parents are truffle-dogs is preferred, as it is said to be more easily trained. In some parts of France, pigs are also trained to seek truffles. In Germany, the name BLACK TRUFFLE is given to the common truffle, and that of WHITE TRUFFLE to *rhizophagon album*, a species of a nearly allied genus, which has also been found in England. It grows half above ground, is of a whitish-red color, and is generally of the size of a large walnut. It is less aromatic than the common truffle, but is used in the same way.

TRUJILLO. See **TRUXILLO**, *ante*.

TRUL'LAN, the name (derived from the hall—Gr. *troullos*)—of the palace in which the fathers assembled) given to the council also called *quinisext* (q. v.).

TRUMBULL, a co. in n.e. Ohio; 625 sq.m.; pop. '80, 44,882—36,196 of American birth, 245 colored. Co. seat, Warren.

TRUMBULL, BENJAMIN, D.D., 1735–1820; b. Conn.; graduated at Yale, 1759; studied under Dr. Wheelock, founder of Dartmouth college; pastor of the Congregational church at North Haven, Conn., 1760, until his death. He served in the revolutionary army as chaplain and volunteer soldier. He published *A Plea in Vindication of the Connecticut Title to the Contested (Western) Lands*; *History of the United States to 1765*; *Twelve Discourses on the Divine Origin of the Scriptures*.

TRUMBULL, HENRY CLAY, b. Conn., 1830; studied at Williston seminary, East Hampton, Mass.; missionary of the American Sunday-school union for Connecticut, 1858; ordained a Congregational minister, 1861; chaplain in the army for three years; missionary secretary of the American Sunday-school union for New England, 1865; removed to Philadelphia, 1875, and became editor of the *Sunday School Times*. He has published *The Sabbath School Concert*; *The Knightly Soldier*, *Memorial of E. B. Preston*; *Falling in Harness*; *Childhood Conversion*; *The Captured Scout of the Army of the James*; *Review Exercises in the Sunday-School*.

TRUMBULL, JAMES HAMMOND, LL.D., b. Conn., 1821; educated at Yale college in the class of 1842. Feeble health prevented his entering professional life, and since 1847 he has been a resident of Hartford. From 1858 to 1861 he was assistant secretary of state, and from 1861 to 1865 secretary. He is among the foremost of American philologists and a well known writer on historical subjects of local interest. He has made a thorough study of the Indian tongues and is said to be the only living man who can read the Eliot Indian Bible. Mr. Trumbull has been state librarian since 1854; from 1849 to 1863 was secretary of the Connecticut historical society, and since 1863 has been its president. Among his many published writings are *The Public Records of Connecticut prior to the Union with New Haven Colony May, 1665*; *Roger Williams's Key to the Indian Language*; and many papers in *Notes and Queries*, in *The New England Historical and Genealogical Register*, and in other periodicals.

TRUMBULL, JOHN, 1750-1831; b. Conn.; passed his examination at Yale college at 7 years of age, though ill-health prevented his entering until 1763; graduated, 1767. In 1769, associated with Timothy Dwight, he wrote essays in the "Spectator" style for newspapers in Boston and New Haven. While a tutor in Yale college, 1771-73, he wrote the *Progress of Dullness*; was admitted to the Connecticut bar in the latter year; entered the office of John Adams in Boston; wrote political essays and *Elegy on the Times*. In New Haven, 1774, he published the first part of *M'Fingal*. He married the daughter of col. Leverett Hubbard of New Haven; resided in Hartford, 1781; and completed *M'Fingal*, 1782. He published *Poetical Works* (2 vols. 1820, latest ed. 1864, with notes by B. J. Lossing). *M'Fingal* was republished by the American Book Exchange, (New York, 1881). Associated with Humphreys, Barlow, and Dr. Lemuel Hopkins he wrote *American Antiquities*. He was in the legislature, 1792 and 1800; judge of the superior court, 1801-19; judge of the court of errors, 1808; treasurer of Yale college for several years. His daughter married gov. Woodbridge of Michigan, and he resided with her in Detroit from 1825 till his death.

TRUMBULL, JOHN, American painter, son of gov. Jonathan Trumbull (said to have been the original "Brother Jonathan") of Connecticut, and brother of gen. Jonathan Trumbull, aide-de-camp to gen. Washington, was b. in Lebanon, Conn., June 6, 1756, was educated at Harvard college, and devoted himself to painting. He had completed two pictures, the "Battle of Cannæ," and the "Judgment of Brutus," at 19, when the war of the revolution broke out, and he joined the provincial army before Boston as adjutant of the 1st Connecticut regiment. The execution of drawings of the British works procured his appointment as aid to Washington, and soon after that of brigade-major. In 1776-77 he served under Gates and Arnold as adjt.gen.; but, offended with the action of congress respecting the date of his commission, he resigned and resumed the palette. In 1780 he came to London, via France, where he was making rapid progress under the instructions of sir Benjamin West, when, during the excitement occasioned by the execution of maj. André, he was thrown into prison. The king, George III., promised West that his life should be spared, but he was kept eight months in prison, and then released on condition of leaving the kingdom. After the war he returned and resumed his studies. His "Priam receiving the Body of Hector," painted at this period, is in the gallery of the Boston Athenæum. In 1786 he produced the first of a series of modern historical and military works, the "Battle of Bunker Hill," followed by the "Death of Montgomery," "Sortie of the Garrison from Gibraltar," exhibited in London in 1789, and engraved by Sharp. He, this year, returned to America, painted several portraits of Washington, and secured likenesses of many of the prominent actors in the revolution; and in 1796 returned to England as secretary of legation to Mr. Jay. He was in England again from 1808 to 1815, painting industriously, but with little success. Returning then to America he was employed by congress to paint four large national pictures for the rotunda of the capitol at Washington—the "Declaration of Independence," "Surrender of Burgoyne," the "Surrender of Cornwallis," and the "Resignation of General Washington, at Annapolis, Dec. 23, 1783." These pictures are chiefly valuable as collections of portraits. He afterward completed a gallery of all his historical pictures, 57 in number, on a smaller scale, which became the property of Yale college, and has great historical value. He was the president of the American academy of fine arts from its foundation in 1816, until the formation of the national academy in 1825; and died in New York, Nov. 10, 1843.

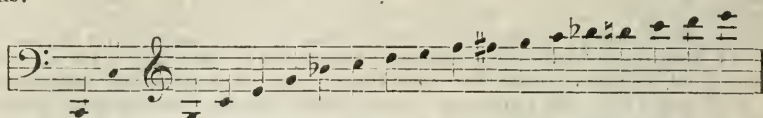
TRUMBULL, JONATHAN, LL.D., 1710-85; b. Conn.; graduated at Harvard in 1727. He studied theology, but in 1731 went into business with his father. In 1733 he entered the Connecticut assembly, of which he was elected speaker in 1739. He was assistant judge of the superior court; chief judge 1766-69. He was deputy governor in 1767-68; and governor, 1769-83, when he resigned. He was active in the cause of the colonists in the disputes which led to the revolution, refused to take the oath to execute the stamp act, and during the revolution was a constant and trusted adviser of Washington, whose familiar reference to him as "Brother Jonathan" may have originated the application of that name to the personification of America—a typical American.

TRUMBULL, JONATHAN, 1740-1809; b. Conn.; graduated at Harvard, 1759. He was speaker of the Connecticut legislature at the beginning of the revolution; paymaster in the army, 1775-78; and, later, secretary and aid to Washington. He served in congress from 1789 to 1795, and as speaker for the last four years; was U. S. senator in 1795; and lieutenant-governor of Connecticut, 1796-98.

TRUMBULL, JOSEPH, 1782-1861; b. Conn.; graduated at Yale, 1801; studied law and began practice in Hartford, 1804, retiring in 1828. He was for some years a member of the legislature; member of congress in 1834; and was elected governor of Connecticut in 1849.

TRUMBULL, LYMAN, b. Conn. 1813; educated at Colechester academy; principal of an academy at Greenville, Ga.; studied law, and admitted to the bar, 1837; settled at Belleville, Ill.; member of legislature, 1840; secretary of state, 1841-42; justice of supreme court of Illinois, 1848-53; member of congress, 1854; senator of United States, 1855; re-elected in 1860 and 1866. Formerly a leading republican, he has of late years acted with the democratic party.

TRUMPET, a musical instrument of great antiquity, which, in its present form, consists of a tube 8 ft. long, less in diameter than the horn, doubled up in the form of a parabola, and sounded by a mouth-piece. It produces the following progression of sounds:



Music for the trumpet, as for the horn (q.v.), is written in the key of C, the key to which the instrument is to be adapted being pointed out by the composer. The pitch is an octave higher than that of the horn. Trumpets in the keys of C, D, and E \flat are most used; but there are also trumpets in A, B \flat , E, F, and G. To enable the trumpet to give a complete series of semitones, finger keys and sliding tubes have been introduced by some makers, rather to the detriment of the freshness and fullness of tone of the instrument.

TRUMPETER, a soldier in a cavalry regiment, whose duty it is to re-pronounce or pass on the orders of the commanding officer; for which purpose certain recognized simple tunes have arbitrary meanings attached to them.

TRUMPET-FISH, or **SNIPE-FISH**, *Centriscus*, a genus of fishes of the family *fistulariæ*, remarkable for the elongated and tubular snout. The only British species (*C. scolopax*), rare on the British coasts, but abundant in the Mediterranean, attains a length of about five inches, the snout projecting about an inch and a half in front of the eyes. The mouth is destitute of teeth. This little fish is esteemed a delicacy, and is often to be seen in the markets of Italy.

TRUMPET FLOWER, the popular name of certain flowering shrubs of the genera *bignonia* and *tecoma*, both of the natural order *bignoniaceæ* (q.v.). *Bignonia capreo lata* is a native of the southern states of America, but often planted in shrubberies and gardens in the middle states. It is a climbing shrub with conjugate leaves and heart-shaped oblong leaflets. The flowers are reddish-yellow, with a long tubular corolla, from the form of which the English name is derived.—*Tecoma radicans* (formerly *Bignonia radicans*) is also a climbing shrub, and a native of the southern states of America, reaching to a more northern latitude than the last. It has much larger flowers, of a scarlet color. The leaves are pinnate, the leaflets ovate and toothed.—*T. grandiflora* is a native of Japan, with pinnate leaves and flowers much larger than *T. radicans*. Both are cultivated with success in the open air in England.

TRUNK-FISH, a family (*ostracionidæ*) of teleost fishes. See **OSTRACION**, *ante*.

TRUNNION. See **GUN**.

TRURO, a municipal and parliamentary borough and sea-port of Cornwall, of which county it is considered the metropolis, though Bodmin (q.v.) is the county town, 8 m. n.e. of Falmouth. It stands at the junction of two rivers, the Allen and the Kenwyn, which are here met by an inlet of the sea called the Truro river, the banks of which present some beautiful scenery, and which admits of vessels of 100 tons burden, passing upward to the quays of the town. Truro is the center of a mining district, and largely exports tin and copper ore. St. Mary's church, a perpendicular edifice of the reign of Henry VII., is the principal building, and is the cathedral church of the bishopric of Truro, founded in 1876. Pop., '71, 11,049.

TRURO, a town in Nova Scotia, co. seat of Colchester co., at the head of Cobequid bay; pop. '71, 3,998. It is on the Intercolonial railway, at the junction of the Pictou branch, 215 m. e. of St. John; 61 m. e. of Halifax. It contains the county buildings, several churches, a branch bank, normal and model schools, and hotels. The leading industries are the manufacture of axles, machinery, iron castings, engines, lasts and pegs, boots and shoes, hats, leather, and wooden-ware.

TRUSS, an instrument employed in the palliative treatment of hernia (q.v.), with the view of preventing its descent, and in some cases of effecting a permanent cure. It consists essentially of a pad or cushion attached to a metallic spring, with straps so arranged that its position may be retained during the varied postures of the body. The necessity of having recourse to a suitable truss the moment that the slightest protrusion shows itself in any of the parts liable to hernia, cannot be too strongly urged as a matter of necessary general knowledge. At whatever period of life a hernia occurs; if properly attended to, and judiciously supported, it usually gives little trouble, and if it occurs in early life, it may often be cured; whereas, if it be neglected, increase of bulk, and subsequently, diseased states of the parts, often terminating in death, will almost certainly occur. A surgeon should always be consulted in the choice of the instrument. "The practice," says Mr. Birkett, "of leaving cases of rupture in the hands of mere tradesmen cannot be too strongly censured. Among the poor we constantly observe the lamentable effects of this proceeding." Many varieties of trusses have been invented. Mr. Kingdon, surgeon to the city of London truss society, considers that the "circular spring truss" is the most suitable form in the majority of cases. There are occasional cases in

which the common truss fails to support a rupture comfortably, and in these cases various instruments, for the most part the property of special instrument-makers, are often serviceable; and the surgeon should be acquainted with the peculiarities of the pieces of apparatus known as the Moccain lever truss, Coles's truss (with a spiral spring acting on the pad), Salmon and Ody's self-adjusting truss, Eggs's truss, etc. The patient must expect to find the truss somewhat uncomfortable for a week or two, but will soon get used to it. The skin of the part upon which it presses should be regularly washed and bathed with eau de Cologne or spirit, as, without this precaution, boils are apt to form on it.

TRUSS. See CONSOLE. Also the framework, composed of tie-beam, rafters, struts, etc., forming one of the principal supports of a roof.

TRUSSING, in ship-building, diagonal timbers or iron plates crossing the ribs internally, and consolidating the whole together. Iron is preferred to wood, as being less heavy and less bulky.

TRUST, in the law of England, is a confidence reposed in some other person touching land or goods for which the *cestui que trust*, or beneficiary, has no remedy except in the chancery division of the high court of justice. It means a species of divided proprietorship, whereby the trustee acts as a custodian or strong-box; and yet the benefit of the property is not his, but belongs to the *cestui que trust*. The person who creates the trust is sometimes called the *celui que trust*. As a general rule, all property, whether real or personal, may be made the subject of a trust, provided some policy of the law or statute does not prevent it. Trusts are most frequently created by a will; but they may be declared by word of mouth as regards personalty; while as to land, some writing is necessary. No particular words are necessary, but the intention of the party making the trust must be clear. Thus, in wills, a testator sometimes uses words which do not amount to an express trust, but speaks of his "wish and desire," or his "confidence" that the executor or trustee shall do certain things. These words are called in the law precatory trusts, but are enforced in the same way as more direct language, if no uncertainty exists as to the purposes or mode of carrying out the trust. But if a testator merely recommends an executor to "consider certain persons," "to be kind to them," or "to do justice to them," or "to make ample provision for them," etc.—such expressions are treated as too vague to be binding, and therefore the executor may disregard them, or use his own discretion. A trustee's is not a compulsory office, but gratuitous, and therefore he need not accept the office unless he pleases. But if he once accept, he is not at liberty afterward to renounce, unless the trust-deed contain a provision enabling him to do so, or the court of chancery for good reasons discharge him. A trustee cannot delegate the office to a third person, but continues personally bound to do his duty. Where there are several trustees appointed, the office is considered joint, so that if one dies, the survivors continue to exercise the office. As a general rule, all must join in doing any act; but if the trust is of a public nature, a majority may bind the minority. Each trustee is liable only for his own acts or defaults, and this is so even though, for form's sake, he join his co-trustees in signing a receipt, if he can show that he never received the money in point of fact. Nevertheless, when money lies in the hands of one trustee, the others ought not to be satisfied with his mere statement that the money has been invested by him, but should see that it is actually done. Another rule is; that a trustee is not allowed to make a gain of his office; and so jealous is an English court of this rule, that the trustees of a large estate are not even allowed to sport over the estate—at least so as thereby to keep any valuable right of that kind for their own pleasure. Hence, a trustee is personally liable if he trade with the trust funds, or buy shares in a joint-stock bank; for even though the trust-deed authorize this to be done, he will be liable to pay the debts of the trading concern, though far exceeding the amount of the trust funds. So, if a trustee is a solicitor, and does legal business for the estate, he will not be allowed to charge for his professional labors, but at most will be allowed only the costs out of pocket. It is seldom, therefore, that a trustee can get any benefit to himself from the trust estate, except in the rare case where the *cestui que trust* is dead without heirs, in which case the property will become the trustee's. This is, however, only so as to real estate; for if the trust estate consist of chattels, then, on the death of the *cestui que trust* without heirs or executors, the property goes to the crown, and not to the trustee. It is the duty of a trustee to keep the trust funds safe: and if they consist of moneys, then he ought to invest them in government stock, and not let the money lie unproductive. He is not entitled to lend the money on personal security, or in the shares of any private company; but he may invest in mortgages, unless he is forbidden by the deed or will. If there is, therefore, no power to invest in mortgages, the trustee must invest in three per cent consols, and a few other government securities. The trustees, as a general rule, must pay interest whether they invest the funds or not (if they have had time to invest) to the *cestui que trust*; and they must account for all the profits they make with the trust funds, whether rightly or wrongfully. If a trustee has grossly misconducted himself as to the trust funds, he will be charged 5 per cent interest, and sometimes with compound interest. A trustee is entitled to be indemnified for all the reasonable expenses or outlay attending the execution of the trust, but he must in general bear the loss of any mistake as to the law; but if there is any peculiar difficulty in carrying out the trust, he is entitled

led to take the opinion of, or even to throw the chief management upon, the court of chancery, as the only safe protection. When trustees are guilty of gross negligence, mismanagement, or misconduct, the court of chancery will remove them and appoint others. In Scotland, there are several technical points of difference from the above in the law of trusts.—Paterson's *Comp. of English and Scottish Law*, s. 201. The chief practical difference is, that the investment of the trust funds in heritable securities or mortgages is considered equivalent or superior to government security, and hence it is the duty of the trustees to prefer such securities, as, owing to the practice of registration of deeds affecting real property, heritable security is always a safe investment there. In Scotland, as in England, trustees holding shares of a joint-stock bank as part of the trust funds, are liable personally to pay the debts of the bank.

TRUST, CHARITABLE, differs from a private trust in that the beneficiaries under the former are either not exactly specified, or are a specified class whose individual members are unascertained. The statute 43 Eliz. gave the chancellor jurisdiction over charitable trusts, which he regulated not as a chancery judge, but as the representative of the crown. The statute named lawful objects of charity. Among the general classes of charitable trusts may be distinguished as supported by the courts, such trusts as are created for the public benefit, e.g., a part; and for the same reason trusts for the creation, endowment, etc., of institutions of education and science. Other good charitable trusts are for the benefit of the Christian religion, for the relief of the poor, the diseased, etc. The English courts, in their desire to carry out the wishes of the donor, applied what is called the *cy pres* doctrine; i.e., when the donor's scheme could not be carried out they would construct another scheme as near the original one as possible. The *cy pres* doctrine does not obtain in this country, where the statute 43 Eliz. has not been re-enacted. In some states the whole system of charitable trusts has been repudiated, and such a trust can take effect only through a corporation.

TRUSTEE, a person who has the legal estate in property, real or personal, for the benefit of another who has the equitable estate. In its widest sense the word is applied to any person who has an interest or power affecting any kind of property for the benefit of another, so that executors, administrators, assignees, directors of corporations, etc., are to a certain extent trustees. The power of a trustee cannot be delegated unless authorized by the instrument creating the trust; and when one trustee dies, the trust, as a rule, devolves upon the survivor or survivors. Trusts are cognizable only in equity; at law the trustee is regarded as the owner of the property. A trustee cannot become the purchaser of the property if it be sold, or make profit out of its use, or speculate with it. A new trustee will be appointed by the court. The trustee is chargeable with the trust fund and its income, and also for such income as he might have derived from the property by proper management. Trustees must act jointly, and cannot act separately like executors.

TRUSTEE PROCESS, established by statute in Massachusetts and some other New England states, whereby an attaching creditor may reach the goods, property, or credits, of a debtor which are in the hands of a third party. The process is by original writ, and the trustees, after service and entry, may testify as to the property alleged to be that of the debtor. The process is the same as that known at common law and in the statutes of most states as garnishment and garnisheeing. See **GARNISH**.

TRUXILLO, or **TRUJILLO**, a t. of Spain, province of Cáceres, on the great highway from Madrid to Badajoz, and 80 m. n.e. of the latter place. There are several churches and convents here. Pop. 4,800, who are engaged chiefly in agricultural work. Truxillo is the birthplace of Pizarro, who was also buried here in the church of Santa Maria de la Concepcion.

TRUXILLO, a t. of Peru, province of Libertad, near the sea-coast, about 300 m. n.n.w. of Callao. The port of Truxillo is Huanchaco, about 8 or 9 m. to the n.w., from which considerable quantities of rice and spices are exported. Pop. 10,000. Truxillo was founded in 1535 by Pizarro, who named it after his birthplace in Spain.

TRUXTON, THOMAS, 1755-1822; b. N. Y.; was capt. of a privateer during the revolution. He was appointed capt. in the U. S. navy in 1795, and four years later, in command of the frigate *Constellation*, captured the French frigate *L'Insurgente*, which lost 29 killed and 41 wounded. The *Constellation* lost but 1 killed and 3 wounded. In 1800 the *Constellation* fought the French frigate *La Vengeance*, which was disabled, with a loss of 50 killed and 110 wounded. The *Constellation* lost 14 killed and 25 wounded. He was high sheriff of Philadelphia, 1816-19.

TRYGON. See **STING RAY**.

TRYON, WILLIAM, LL.D., 1725-88; b. Ireland; an officer in the British army. He was made lieutenant-governor of North Carolina in 1764; and governor on the death of gov. Dobbs the next year. During his administration he put down the revolt of the so-called "regulators." He became governor of New York in 1771, and resigned in 1778. He was made a maj.gen. in 1777. He made himself generally detested by his severity, and by the ravages committed during his expedition to Connecticut, where he burned Danbury and other towns.

TRYSAIL, a small fore-and-aft sail, mounted by a cutter or schooner in a storm, when the wind is too violent for her to carry her ordinary canvas.

TSARSKOË SE'LO (i.e., imperial town), a t. of Russia, in the province of St. Petersburg, and 13 m. s. of the city of that name. It is the royal residence and favorite resort of the imperial family. The carriage road from the capital to this town was constructed by the empress Catharine II. at a cost of 1,000,000 rubles; but the *route* now preferred is that of the railroad—the first laid down in Russia. The façade of the great palace of Tsarskoë Selo is 780 ft. long. Originally, every statue, pedestal, and capital of the columns, vases, etc., was covered with gold-leaf; only the dome and cupolas of the church are now gilded. The interior of the chapel is lavishly gilded, the ceiling being one sheet of gold. There are several elegant rooms, though most of them are more remarkable for barbaric splendor than for taste. In the palace grounds, which are 18 m. in circumference, is an arsenal, containing a magnificent collection of armor, weapons, and accouterments of all kinds. The grounds also contain several curious ornamental buildings, statues, artificial ruins, grottoes, lakes, waterfalls, etc. The population in '67 amounted to 9,741.

TSCHUDI, an ancient and noble family in the Swiss canton of Glarus, several members of which have distinguished themselves as authors, statesmen, and warriors. The two following are the most notable of the Tschudi: GILLES, or AEGIDIUS (b. 1505, died 1572), who was active on the Catholic side during the struggles of the reformation in Switzerland, and in consequence was forced for a time to leave his native canton (1562), but was permitted to return two years afterward. He was a prolific writer, not less than 166 works of his, in print or in MS., being known. The most valuable is a *History of Switzerland* (Basel, 2 vols., 1734). See Fuch's *Aegid. Tschudi's Leben und Schriften* (2 vols., St. Gall, 1805). To the same family belongs JOHANN JAKOB VON TSCHUDI, the eminent traveler and naturalist, b. at Glarus, July 25, 1818. After completing his studies at Leyden and Paris, he undertook (1838) a voyage round the world; but circumstances restricted his design to an investigation into the natural history and ethnography of Peru, where he remained for five years. On his return to Europe (1843), he wished to join the Arctic expedition of sir John Franklin, but was again prevented by circumstances from doing so, and finally settled in Austria. In 1868 he was made Swiss ambassador at Vienna. Tschudi's principal works are: *Peru: Reiseskizzen aus den Jahren 1838-42* (2 vols., St. Gall, 1846); *Untersuchungen über die Fauna Peruana* (St. Gall, 1844-47, with 76 plates); the splendid work, *Antigüedades Peruanas* (Vien. 1851), executed in conjunction with don Mariano Eduardo de Rivera (Eng. trans. 1854); *Die Kechuasprache* (2 vols., Vien. 1853), containing a grammar and dictionary of the Peruvian language; and his *Reisen durch Südamerika* (5 vols., 1868).

TSETSE, *Glossinia morsitans*, a dipterous insect, which is a terrible pest of some parts of s. Africa. It is not much larger than the common house-fly, of a brown color, with four yellow bars across the abdomen. The wings project considerably beyond the abdomen. It is remarkably alert, at least during the heat of the day, and dexterously avoids any attempt to catch it with the hand. "Its peculiar buzz," Livingstone says, "can never be forgotten by the traveler whose means of locomotion are domestic animals." Its bite is almost certain death to the ox, horse, and dog. Livingstone, in one of his journeys, lost 43 fine oxen by it. Yet the bite is harmless to man, to the mule, the ass, and apparently to antelopes and the other wild animals of the country. The proboscis is adapted for piercing the skin, and the fly lives by sucking blood. At first no effect is perceived; but in a few days after an ox has been bitten by the tsetse, the eyes and nose begin to run, "the coat starves as if the animal were cold," a swelling appears under the jaw, and sometimes at the navel, emaciation and flaccidity of the muscles ensue, purging, sometimes staggering and madness, and finally death. On dissection, the cellular tissue under the skin is found to be injected with air, as if a quantity of soap-bubbles were scattered over it.—Livingstone's *Travels*.

TSONG-KHA-PA (orthographically, tTsong kha pa*) is the great reformer of Lamaism (q.v.), who, by his co religionists, was considered to be an incarnation of the Bodhisattwa Amitābha, or, according to others, of Manjus'ri or Vajrapāṇi, and after his death, was canonized by the Lamaist church. He was born in the middle of the 14th c. after Christ, in the country Amdo, in the place where now the celebrated convent ssKu'bum is situated. According to the legends of Tibet, he was conceived by his mother in a supernatural, immaculate manner: he was born with a white beard, and from the day of his birth expressed himself clearly and fluently, and discoursed profoundly on religious matters. In his third year he resolved to renounce the world. His mother accordingly cut off his long beautiful hair; but when it fell to the ground, a tree grew up—which is still in a court-yard of the convent of ssKu'bum, and was seen and described by the missionaries Huc and Gabet, in the year 1845. The leaves of this tree are covered with one or more letters of the sacred Tibetan alphabet. He now lived retired from the world, entirely devoting himself to prayer and contemplation. A learned Lama from the west, "with a long nose and bright eyes," came to settle about this time in Amdo, and seems to have become his teacher. After his death, Tsong-kha-pa set out to Tibet,

* The small letters prefixed to the initials of the Tibetan words in this article are not pronounced.

and traveled until he came near Lhasa, where a god bade him halt. Here he studied assiduously the Buddhist law, and soon became convinced of the necessity of reforming the actual worship and discipline of the Lamaist church. When his teaching attracted a great number of pupils, and when these, in order to distinguish themselves from the followers of the old system, who wore a red cap, assumed as their mark a yellow cap, the head of the Lamaist church resolved to stop the innovator in his dangerous course, and accordingly summoned him to his presence. But Tsong-kha-pa did not deign to obey his command. Thereupon, the great Lama repaired in person to the bold monk; but when he entered the cell of Tsong-kha-pa, his red cap fell off—and when he began to descend on the superiority of the old system, Tsong-kha-pa—seated and turning the beads of his rosary—without raising his eyes, cried out, “Miserable! I hear the groans of a creature whom thou murderest!” And, in fact, unmindful of the first commandment of the Buddhist law, the great Lama was busy crushing a louse which he had caught. Confused, he fell at the feet of Tsong-kha-pa; and from this moment no further resistance could be made to his reforms. Such is the legend; but independently of it, history tells us that the influence which Tsong-kha-pa exercised on the reform of Lamaism, though not miraculous, was very powerful, such as to reduce the wearers of the red cap to a small minority. His reputation having widely spread, thousands of pupils thronged round him to hear and to adopt his doctrine. In consequence, in 1407 or 1409, he founded the convent *aGa’ lDan*; and when this could no longer contain the number of his adherents, two other convents, which together, it is said, are now peopled with 30,000 monks of the yellow cap. His works are numerous and voluminous; the most celebrated of them is the *Lam nim chhen po*, or “The great Step-road toward Perfection,” consisting of three parts, viz., “the road of the little, middle, and great man.” The sect which he founded, and which adopted the yellow cap, is called *aGe lugss pa*, or the sect of virtue; and the principal reforms which he introduced into the Lama religion as it then existed, were compulsory celibacy for the monks—the Lamas of the old doctrine being conditionally permitted to marry—prohibition of sorcery and necromancy—which were extensively practiced by the wearers of the red cap—and the institution, at fixed periods, of religious exercises and of common prayers, and, consequently, of regular meetings of the whole community. His greatest achievement, however, was the organization of the Lamaist hierarchy as it still exists. See LAMAISM. He died in 1419. His body is preserved in the convent *aGa’ lDan*: it is free from decay; and, like the tomb of Mohammed at Medina, suspended in the air without any support. His portrait is seen in all the temples of the yellow religion, often between those of the two Lamaist popes, of whom the *Dalai Lama* is at his right, and the *Pan chhen Rin po chhe* at his left. He is recognizable by two lotus flowers which he holds in his hands, folded for prayer, and one of which usually carries in its calyx a candle, while the other supports a book. His canonical name is *bLo bSang graggs pa*, or “the celebrated sage.”—See for further detail, C. F. Koepfen, *Die Lamaische Hierarchie und Kirche* (Berlin, 1839), and the works quoted there.

T-SQUARE, an instrument consisting of two arms, the stock and the blade, used for drawing parallel lines.

TSURUGA, a Japanese sea-port on the w. side of the main island, on Tsuruga bay; pop. about 20,000. It is connected with Osaka and Kioto by railroad, and with lake Biwa by canal. Its harbor is the best on the w. coast, and it has a large trade. The surrounding country is rich in tea, silk, rice, etc.

TSUSHIMA. A pair of islands which command the southern entrance to the sea of Japan, between parallels 34 and 35 of n. latitude; pop. 30,000. The channel which divides the two islands varies in width from 16 yds. to many miles. The southern island, which is about 125 m. in circumference, contains many mountains and deep ravines, and the city of Fukuye, with a pop. of 10,000. The northern island which has a coast line of about 400 m., is noted for its beautiful bays, of which the chief is Waniura, 32 m. from Fusan, the chief port of Corea. The people are mostly fishermen, and export great quantities of dried fish, mushrooms, sea-weed, and timber in the China trade. The first gold and silver mined in Japan were found here; and there is coal of good quality. From ancient times, the position of Tsushima has made it a battle-ground between the Japanese and Koreans, Mongols, and Chinese. One of the severest battles, in the 13th c. was the resistance of the Japanese garrison to the hosts of Khublai Khan. Of late years, the valuable mineral resources, and the capacious bays and harbors and commanding strategic position of Tsushima, have led Russia to covet it, and an attempt to occupy it, 1860, was frustrated only by the presence and energetic opposition of sir James Hope of the British navy. Its seizure by the Russians, or, in case of war between Russia and England, by either of them, is feared by the Japanese.

TUAM, an inland market-t. and episcopal seat, as well as center of a poor-law union, of Galway, Ireland, is situated on the Harrow, a branch of the Clare, 125 m. w. from Dublin, with which it is connected by a branch from the Midland Great Western railway. The pop. in 1871 was 4,223, of whom 3,898 were Roman Catholics, the rest Protestants of the Episcopal church and of the other denominations. It has been an archiepiscopal see since the 12th c., and continues to have this rank in the Roman Catholic church; but in 1839, the province was united in the Established church with the

archbishopric of Armagh, of which Tuam is now a suffragan see. The town possesses little trade, except in agricultural produce; but there are some tanneries, a flour-mill, and a brewery. The Roman Catholic church, which is a modern structure, is of great size, and of very striking architecture. Both the Roman Catholic archbishop and the Protestant bishop have residences in Tuam.; and under the direction of the former is the college of St. Jarlath, numerously attended, but designed chiefly for clerical students. The municipal affairs are under the direction of commissioners. The schools, which are under the care of the brethren of the Franciscan order, are numerously attended.

TUARIKS. See BERBERS.

TUBER. in botany, a subterranean stem, thickened by the approximation of the nodes and swelling of the internodes, with latent buds along its sides ready to produce new plants in the succeeding year. The cellular tissue is unusually developed, and in general a large quantity of amylaceous matter is accumulated, whence the economical value of tubers, as in the potato, the Jerusalem artichoke, and the arrow-root. Tubers are capable of being employed for the propagation of the plant, by division into portions, each containing an *eye* or bud, according to the usual mode of planting potatoes. Like bulbs and corms, they may be regarded as a store laid up for the plant itself, that it may spring with new vigor in a new year. Like them, also, and even in a greater degree, they are in many cases a provision for the use of man. The most valuable tubers are those already named, but many others are used in different parts of the world. See *OXALIDEÆ*, *TROPEOLUM*, etc.

TUBERCLE is a word that has been employed by pathologists of different epochs in very different senses. The older writers employed the term merely to express an external form; and everything was called a tubercle which manifested itself in the form of a small knot. Without entering into any discussion of the views of Laennec (who asserted that tubercle presented itself in the lungs under two different aspects—namely, as *tubercular infiltration* and *tubercular granulation*, and thus opposed the old-knot-theory), of Lebert (who was the first accurately to describe the so-called “tubercle-corpuscles”), of Reinhardt (who, with many others, holds that tubercle is nothing more than one of the forms presented by inflammatory products when undergoing transformation, and that all tubercular matter is really inspissated pus), or of Rokitsansky, Van der Kolk, Williams, Walsh, Paget, and other eminent pathologists, we shall briefly give the theory of tubercle which Virchow adopts in his *Cellular Pathology*, and which is perhaps more generally adopted than any other. Virchow holds that tubercle is a granule or a knot, and that this knot constitutes a new formation, which from the time of its earliest development, is necessarily of a cellular nature, and like all other new formations, has its origin in connective tissue. When this new formation has reached a certain degree of development, it constitutes a minute knot; and if it is near the surface, it forms a little protuberance, its mass consisting of small nucleated cells. The great characteristic of this formation is its extreme richness in nuclei, of which, at a first glance, it seems entirely to consist. But upon isolating the constituents of the mass, either very small cells with a single nucleus are seen, or larger cells with twelve, twenty-four, or even more divided nuclei are observed, these nuclei being always small, and having a homogeneous and somewhat shining appearance. In its minute nuclei and very small cells, tubercle contrasts strongly with the large and comparatively gigantic corpuscles of some of the more highly organized forms of cancer. To use the expressive language of Virchow; “tubercle is always a pitiful production, from its very outset, miserable.” For an account of the *cheesy metamorphosis* which subsequently characterizes the tubercle, and which is the regular but not the invariable termination of this formation (since tubercle *may* undergo a complete fatty metamorphosis, and become capable of absorption, or may undergo calcareous degeneration, in which form it remains comparatively inert), we must refer to the above-named pathologist's *Cellular Pathology*, translated by Chance (Lond. 1860), to Rokitsansky's *Morbid Anatomy*, vol. i., and to Paget's *Surgical Pathology*.

Tubercle is usually described as occurring in two principal forms, the first being distinguished as the yellow, and the latter as the gray; the latter is also known from its ordinary size as the military tubercle. The latter is the tubercle to which the above description of Virchow applies, the yellow being the same in a state of fatty degeneration or cheesy metamorphosis. In consumption, we often find large masses of softening tubercular matter in the lungs and elsewhere. These large masses are formed by the aggregation of smaller masses, which have coalesced as the deposit continued to increase. The intervening tissues at length suppurate, and thus soften and break down the tubercular matter, and lead to its expulsion; for a process of ulceration having been established into the surrounding tissues, the softened tubercle is brought up by coughing, and a cavity or *romica* is formed at the spot previously occupied by the morbid deposit. It is a remarkable fact, and one of the greatest importance in the diagnosis of consumption, that tubercles, when they affect the lungs, are almost invariably deposited in the upper lobes. When it is stated that consumption is only one manifestation of scrofula (q.v.), and tubercle is the essential element of scrofula, it will be seen that the importance of this subject cannot be overrated. The reader may consult Mr. Ancell's elaborate volume *On Tuberculosis*; or a clever essay, with a similar title, by Dr. Dobell.

TUBEROSE, *Polianthes*, a genus of plants of the natural order *liliaceæ*, having a funnel-shaped perianth, with 6-parted limb, stamens inserted in the tube of the corolla, a superior capsule, and flat seeds. The COMMON TUBEROSE, (*P. tuberosa*) has rounded bulbous root; a cylindrical, upright, unbranched stem, 3 or 4 ft. high; both root-leaves and stem-leaves sword-shaped, and very acute; flowers spiked and somewhat aggregated, large, pure white, the tube a little curved. The plant grows well in the s. of Europe, but only bears the open air in more northern climates during summer. The roots are a considerable article of export from the s. to the n. of Europe; the plant being in high esteem for the beauty and fragrance of its flowers, the odor of which is most powerful after sunset, and has been known to cause headache and asphyxia in a room. The fading flowers emit, in certain states of the atmosphere, an electric light and sparks. The flowers yield an essential oil, which is used by perfumers. The native country of the tuberose is not quite certain. Another species, *P. gracilis*, is found in Brazil, and has been supposed to be the original of the cultivated plant. The tuberose has been known in Europe for about three centuries.

TUBE-WELL is an American contrivance, introduced into England in 1867, having for its object the obtaining of a small supply of water in a very short space of time by the application of a limited amount of manual power.

The apparatus comprises three parts—a tube or well, a rammer or monkey, and a pump. The tube consists of an iron pipe about $1\frac{1}{2}$ in. diameter, made in pieces of convenient length, which can be screwed together end to end. The pipe terminates at the lower end with a solid tempered steel point, and is perforated for about 16 in. from the end with small lateral apertures. The pipe is driven a short way into the ground, just sufficient to keep it upright without falling, and is temporarily kept in that position by hand. A strong iron clamp is fixed to the tube by clamping-screws at a short distance above the ground; and another clamp is similarly fixed higher up. Two pulleys are supported by the upper clamp. The rammer or monkey, consists of a 56 lb. iron weight, which slides up and down the tube, encircling it like a ring or belt. The rammer, being raised by two men, is allowed to fall with its full weight on the lower clamp; thus giving a series of blows which drive the tube into the ground. When the lower clamp becomes level with the surface of the ground, it is raised up the tube; as is likewise the other clamp, which supports the two pulleys. Successive lengths of tube and successive shiftings of the clamps afford the means of enabling the perforated end of the tube to reach soil whence water can be obtained. When the symptoms appear of water having been reached a small suction-pump is applied, and the water pumped. It is only when water is expected to be reached at a moderate distance below the surface that this apparatus is available, as it is not powerful enough for great depths, nor is the bore of the tube sufficient for a large influx of water; but the required conditions being found to exist, the apparatus saves a large amount of ordinary boring. As the water is pumped up, the loose sand and gravel disappear from the point of the tube, allowing the formation of a small pool or well; while small pebbles which collect around the perforations act as a sort of filter. The tube can be extracted from the ground by forcing the rammer upward against the upper clamp.

During the trial of this apparatus in the cricket-ground at Old Trafford, Manchester, the tube was sunk to a depth of 10 ft. in 22 minutes, and water had been reached in even less than that time. Such a form of well, it is considered, will be free from the liability of received dirty surface-water; and no accident is possible from foul air or from the falling in of the sides. A well 15 ft. deep was sunk in one hour in the botanical gardens at Manchester, and excellent water reached. Another was sunk in the grounds of St. Cloud in half an hour, and pumped up water at the rate of 20 liters (18 quarts) per minute. The inventor accompanied the American federal army, and enabled the troops frequently to obtain water by the aid of these pumps. On one occasion, to try the capabilities of the tube, he sank one to a depth of 150 ft. at Ithaca, in New York state. Tube-wells were sent out with the British military force to Abyssinia.

TUBICOLÆ, an order of *annelida* (q.v.), having a tubular shelly covering, into which the animal can entirely retreat, but from which, when undisturbed, and disposed to activity, it projects its head and gill-tufts. The genus *serpula* (q.v.) is a good example.

TUBICOLIDÆ, or **GASTROCHENIDÆ**, a family of lamellibranchiate mollusks, remarkable for the calcareous tube into which the proper shell is cemented. Examples are noticed in the articles **ASPERGILLUM**, **CLAVAGELLA**, and **GASTROCHENA**. The *pholadidæ*, including *pholas* (q.v.) and *teredo* (q.v.), are included by some in this family. *Teredo* has the characteristic tube, but *pholas* has not.

TÜBINGEN, an important t. of Württemberg, in the circle of the Black forest, 20 m. s.s.w. of Stuttgart, is situated on the Neckar, at the influx of the Steinlach, in one of the most beautiful and fertile districts of the Oberland. Tübingen is an old place, irregularly built, with steep and narrow streets in the main; but the suburbs, especially round about the new university, are very pleasant. Westward from Tübingen is the Schloss, built by duke Ulrich in 1535. Book-printing, book-selling, working in copper, weaving, bleaching, trading in field-produce, wine, and fruits, form the principal sources of employment. Tübingen has three Protestant churches and one Catholic church, a

Bible society, a chamber of manufactures, and various educational and benevolent institutions. But it owes its celebrity wholly to its university. Founded in 1477 by Eberhard im Bart, afterward first duke of Württemberg, the university of Tübingen soon became a distinguished seat of learning, enjoyed for a time the presence of Reuchlin (q.v.), and Melanchthon (q.v.), and continued to flourish long after the reformation had firmly established itself. The thirty years' war, however, fatally checked its prosperity: and it was not till the early part of the present century that it began to reacquire a reputation. Under Baur (q.v.) it has recently become celebrated as a school of historico-philosophical theology, known as the "Tübingen school," the influence of which on the development of religious thought has been very great, and is likely to prove permanent. The university has six faculties, above 80 professors and teachers, a library of 200,000 vols. (located in duke Ulrich's *Schloss*), and is attended annually by from 700 to 850 students, of whom between 200 and 300 are foreigners. Connected with it are an anatomical and physical institute, a botanical garden, a chemical laboratory, a collection of zoology and comparative anatomy, one of minerals, one of coins and antiquities, fencing, gymnastic, and swimming schools, etc. Pop. of Tübingen '71, 9,343.

TUBULAR BRIDGE. The advantages of the tube for carrying a level roadway across a large span were brought into general notice by Robert Stephenson, engineer of the Chester and Holyhead railway, in the construction of the bridges to carry that railway across the Menai strait. It was required by the admiralty that these bridges, called the Britannia and Conway, should be constructed, so as not to interfere with the navigation, with clear spans of upward of 400 feet. The largest arched spans that had been previously constructed did not exceed 240 ft.; and suspension-bridges not being suitable for heavy and rapid railway traffic, the engineer was obliged to devise some new form, which should conform to the stipulated conditions. Mr. Stephenson having decided upon the tubular form, proceeded, in conjunction with Mr. Fairbairn, to make an elaborate series of experiments on tubes, to determine the most suitable arrangement of the wrought iron of which they were to be composed. They found that a rectangular tube, of which the top and bottom were cellular, gave the greatest strength with the least material. The span of the Conway tube was 400 ft.; while the tubular part of the Britannia bridge consisted of two spans of 460 ft., and two of 230 ft. each in the clear. The foundation-stones of these bridges were laid in 1846 and 1847 respectively. Since that time, many important bridges have been constructed on this principle. One of the largest and most important is the Victoria bridge, over the St. Lawrence, near Montreal, in Canada. The total length of this bridge is 9,144 ft., or nearly $1\frac{1}{2}$ miles. It is built in 24 spans, of from 242 to 247 ft. each, and one of 330 feet. The greatest depth of the river is 22 ft., and the average rate of the current 7 m. per hour. The bottom of the center tube is 60 ft., and at the abutments the bottom is 36 ft. above the water, so that there is a rise of 1 in 130 in the roadway toward the center of the bridge. An idea of the stupendous nature of this structure may be formed from the facts that 9,000 tons of iron were used in the tubes, and $1\frac{1}{2}$ millions of rivets; also that the total surface of iron was 32 acres; and as it received 4 coats of paint, the total painting was 128 acres. There were 2,713,095 cubic ft. of masonry, and 2,230,000 cubic ft. of timber in the temporary works, dams, etc.; and upward of 3,000 men were employed. The first stone was laid July 20, 1854, and the first train passed over on Dec. 17, 1859. The total cost was £1,400,000, or about £57 per lineal foot. Notwithstanding the success of these structures, the tubular form has been to a great extent superseded in recent structures by the lattice or trellis. This has arisen from the great saving in the material of which the sides are composed, effected by the open lattice-work, as compared with the solid plated side of the tube. By the lattice arrangement, the material is more capable of arrangement in the direct line of the strains; and the section of the lattice-bars can be accommodated to the strain, so that there shall be no material which is not carrying its due share of the load. The first large structure of this nature was the Boyne viaduct, on the Dublin and Belfast Junction railway. Mr. Barton, the designer of this structure, in a notice of this bridge, gives the relative weight in the sides of the different forms of girders, neglecting the weights of the top and bottom, which are the same in every case, as follows: ordinary tubular girder, 100; girder as adopted in great exhibition, 117; Warren's girder (angle of bars 60°), 73; lattice girder (angle of bars 45°), 67. Besides this considerable saving in material, the facilities this form gives for repairs and painting, and the exposure of a smaller surface to the wind, are additional reasons for its preference.

TUBULIBRANCHIA' TA, an order of gasteropodous mollusks, having two branchiæ behind the heart, the whole animal inclosed in a long shelly tube, which is sometimes straight, sometimes twisted in an irregularly spiral manner.

TUCK, JOSEPH HENRY, b. Mass. 1812; a watch-maker and candle-maker, who was a civil engineer in London, 1837-65, when he returned to the United States. He made the plans for the excavation of the Suez canal, and organized the company which in 1848-49 laid the first submarine cable from Dover to Calais. Among his many inventions are a rotary steam-engine and a dredging machine.

TUCKAHOE, the Indian name of a curious vegetable product of underground growth, somewhat resembling the truffle, but not to be classed with the *fungi*. Its composition is almost entirely of *pectine*, and in southern states it is used as an article of

diet in sickness to take the place of arrowroot. It is found in balls varying from an inch to 8 in. in diameter, and is entirely devoid of cellular structure. Its origin and method of growth are unknown.

TUCKER, a co. in n.e. West Virginia; 400 sq.m.; pop. '80, 3,151—3,139 of American birth, 26 colored. Co. seat, St. George.

TUCKER, ABRAHAM, an English author whose reputation falls far short of his merits, was b. in London, Sept. 2, 1705, studied at Merton college, Oxford, and in 1726 became a member of the inner temple. Tucker, who was of good family, inherited a large fortune from his father; and in 1727 purchased Betchworth castle and estate, near Dorking, in Surrey. During his life he enjoyed all the ease, comfort, and quiet happiness of an English gentleman of the 18th century. It is but fair to state that his frank, generous, virtuous nature, and his sincere love of intellectual pursuits, prevented him from misusing the advantages of his position. In 1736 he married Dorothy, daughter of Edward Barker, esq.—afterward cursoritor baron of the exchequer, and receiver of the tenths—by whom he had three daughters, the youngest of whom, Dorothy Maria, became in 1763 the wife of sir Henry Paulet St. John, bart. Tucker's affectionate regard for his family is a beautiful feature in his character. He was, too, all his life, an industrious student, a man of keen observation, of much innocent and cheerful humor, and withal, of methodical business habits. His death occurred Nov. 20, 1774. Tucker's great work is entitled *The Light of Nature Pursued*. It was begun in 1756, and formed the chief literary occupation of the rest of his life. It extended to seven volumes, only three of which were published in the author's lifetime, under the pseudonym of Edward Search, esq. It is not a regular systematic treatise, but consists of a series of disquisitions on metaphysics, theology, morals, etc., all of which exhibit a remarkable originality, simplicity of humor, ingenuity of illustration, and solidity of understanding. Scarcely any English book of the 18th c. is more deserving of study, and scarcely any has been more neglected. A critic in the *Saturday Review* (Nov. 12, 1864) has given an intelligent appreciation of its peculiar merits. The best edition of *The Light of Nature* is that published by the author's grandson, sir Henry Mildmay, reprinted in 1837. A later edition is that by the rev. Dr. Cairns of Berwick.

TUCKER, JOSIAH, D.D., 1711-99; b. Wales; graduate of St. John's college, Oxford; rector of St. Stephen's, Bristol; prebend, 1755; dean of Gloucester, 1758 till his death. He was a thorough student, and careful writer on political economy and subjects pertaining to religion, and published several pamphlets in the beginning of the contest between the English government and its American colonics in favor of the colonists.

TUCKER, NATHANIEL BEVERLEY, 1784-1851; b. Va.; educated at William and Mary college; studied law, and in 1815 began practice in Missouri. In 1834 he was appointed a professor in William and Mary college, and held the position until his death. He published treatises on *Pleading* and on *Constitutional Law*, and novels, of which *The Partisan Leader*, reprinted in 1861, has some historical interest, and has been thought to foreshadow dimly the war of secession.

TUCKER, SAINT GEORGE, LL.D., 1752-1827; b. Bermuda; educated at William and Mary college, and called to the bar. He took part in an expedition against Bermuda in 1777, and was dangerously wounded at Yorktown, where he commanded a regiment. He was afterward a member of the Virginia legislature, a professor at William and Mary college, and for many years a judge in Virginia. Among his publications were an edition of Blackstone's *Commentaries*; and *A Dissertation on Slavery* (1796).

TUCKER, SAMUEL, 1747-1833; b. Mass.; made capt. in the American navy in 1777. The next year he commanded the frigate *Boston*, which took over John Adams, recently appointed minister to France. After the capture of several prizes he took part in the defense of Charleston, S. C., at whose capture he was made prisoner in 1780. Exchanged the next year he commanded the *Thorn*, making many prizes. He afterward removed to Maine, and served in the legislature.

TUCKERMAN, HENRY THEODORE, 1813-71, b. Boston; educated in the public school. Among his works are *The Italian Sketch Book* (1835); *Isabel; or Sicily, a Pilgrimage* (1839); *Rambles and Reveries* (1841); *Artist Life* (1847); *Characteristics of Literature* (1849); *The Optimist* (1850); *A Memorial of Horatio Greenough* (1853); *The Rebellion*, (1861); *America and her Commentators* (1864); *The Criterion* (1866); *Maga: Papers about Paris* (1867); *Book of the Artists* (1868). He was also a frequent contributor to periodical literature. He lived in New York city after 1845.

TUCKERMAN, JOSEPH, D.D., 1778-1840; b. Boston; graduated at Harvard college, 1798; studied theology, and became a Unitarian pastor in Chelsea. He is best known as one of the founders of the first sailors' aid societies in the country, and from his connection with other benevolent societies here and in England. He wrote *Principles and Results of the Ministry at Large*, and other religious pamphlets.

TUCSON, a city in s. Arizona, formerly the capital, founded by Jesuits in 1560; a military post ceded to the United States in the "Gadsden purchase" 1853; incorporated 1871; co. seat of Pima county; pop. about 5,000. It is in the valley of the Rio Santa Cruz, 2,520 ft. above the level of the sea, 370 m. s.w. of Santa Fé. It is on the Southern

Pacific railroad, and contains a Roman Catholic church, and the institute of St. Joseph under the charge of the sisters. It has narrow streets, plazas, and adobe houses, a bank, a weekly newspaper, a U. S. post office and money-order office, and a court house. At a distance of 7 m. is the military post of camp Lowell. Flour is manufactured. Large numbers of stock are raised, and gold-dust, hides, and wool, are exported. It has an important trade with Sonora, Mexico, in supplies for the Indians and the military, the business in one year amounting to \$1,800,000.

TUCUM' AND TUCUMA' PALMS. See **ASTROCARYUM.**

TUCUMAN', a prov. in n. Argentine republic, having on the e. the Gran Chaco, on the n. Salta, on the w. Catamarca, on the s. Santiago; 12,226 sq.m.; pop. about 108,953. It contains gold, copper, silver, and lead mines. Salt, from mines and lakes, cattle and mules are exported. Large crops of cereals are raised. It has important manufactures of leather, cotton, wool, and cheese. Capital, Tucuman.

TUCUMAN', **SAN MIGUEL DE**, a t. of the Argentine confederation, capital of the province of the same name, about 120 m. n.w. of Santiago, is embosomed in splendid plantations of fruit-trees. Tucuman has a cathedral, convents, a Jesuits' college, and many handsome houses. It carries on manufactures of sugar, leather, and brandy, has an active trade in oxen and mules; and the females are noted throughout the confederation for their skill in making saddle-cloths. Pop. 17,000. Here, in 1816, a congress of deputies from the various Argentine provinces met, and proclaimed their independence of Spain.

TUDE'LA (the *Tutela* of the Romans), a city of Spain, province of Navarra, on the left bank of the Ebro, which is here crossed by a bridge of 17 arches, 46 m. by railway n.w. of Saragossa. It is a dull, gloomy-looking place, with narrow streets and lofty houses; but the promenades along the river are very fine, as also are the *plazas*, or public squares. Tudela is the seat of a bishop, has a Gothic cathedral, a medical college, and manufactures of coarse woolen cloths, soap, earthenware, etc., and carries on an active trade in the products of the district. Pop. 8,900.

TUDOR, the surname of a family of Welsh extraction, which occupied the throne of England from 1485 to 1603. In the Welsh language Tudor is the equivalent of Theodore. Owen Tudor, the first of the race known in history, has had a pedigree assigned him from the ancient Welsh princes, which rests on no very solid evidence. In fact little is known of his origin, except that his father had to quit Wales on a charge of murder, and was outlawed. He seems himself to have been at one time a brewer at Beaumaris, in Anglesey; and he was afterward a retainer in the suite of the bishop of Bangor, and fought at Agincourt. His dancing at some court pageant is said to have first ingratiated him with Catharine of Valois, widow of Henry V., who appointed him to the office of clerk of the household, and before long entered either into an illicit connection or a private marriage with him. The indignation of the public at this step obliged the queen to take refuge in a convent at Bermondsey, where she died; and Tudor was sent to Newgate, but succeeded in escaping, and obtaining two audiences of the young king, Henry VI., who afforded him protection, and conferred on him the lieutenancy of Denbigh. Two sons had been born to him by the queen. On the elder, Edmond, the king bestowed the earldom of Richmond; and on the younger, Jasper, the earldom of Pembroke. The earl of Richmond married Margaret, daughter and heiress of John Beaufort, earl of Somerset, whose father was an illegitimate son of John of Gaunt by Katherine Swynford. The sole issue of Richmond and the heiress of Somerset, Henry, duke of Richmond, invited from abroad to deliver England from Richard III., ascended the throne after Richard's death at Bosworth as Henry VII. The partisans of the house of Lancaster supported him on the extinction of the lawful descendants of John of Gaunt; and by his marriage with Elizabeth, eldest daughter of Edward IV., and representative of the house of York, he was considered to have united the factions of the white and red rose. Five sovereigns of the house of Tudor successively occupied the throne—viz., Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth—for an account of whom see separate articles. From Elizabeth, the last of the line, the crown passed to James VI. of Scotland, of the house of Stuart, in virtue of his descent from Margaret Tudor, daughter of Henry VII., and queen of the Scottish James IV. Strength of will was the prominent characteristic of the sovereigns of the house of Tudor; their rule, generally prosperous, was far more arbitrary and despotic than that of the Plantagenets. Parliament was in many cases but the exponent of the royal will, and taxes were frequently exacted, and penal statutes dispensed with, by the prerogative alone. The condition of England under the Tudors differed from despotic monarchies chiefly in the important respect that the sovereign had no standing army. The Tudor monarchs exercised a remarkable influence on ecclesiastical affairs; it was under their rule that the reformation took place, and the Anglican church was developed.

TUDOR, WILLIAM, 1750-1819; b. Boston, Mass.; graduated at Harvard, 1769; studied law with John Adams, and began practice in 1772. He became a col. and judge advocate general in the revolutionary army. After the war he was member of the legislature

and secretary of state in Massachusetts, was vice-president of the state division of the Cincinnati, and one of the founders of the Massachusetts historical society.

TUDOR, WILLIAM, 1779-1830; b. Boston; graduated at Harvard in 1796. After a tour in Europe he founded the Anthology club, and contributed to its journal, the *Monthly Anthology*. In 1815 he founded the *North American Review*, writing most of the first four volumes. He was appointed consul at Lima in 1823, and *chargé d'affaires* in Brazil in 1827. He published *Letters on the Eastern States* (1820); *Life of James Otis* (1823), and other works. He was the originator of Bunker Hill monument.

TUDOR STYLE, in architecture, a rather indefinite term applied to the late perpendicular, and the transition from that to Elizabethan.

TUESDAY, the third day of the week, is so called from *Tiwesdag*, the day of Tiw or Tin, the old Saxon name for the god of war. See **TYR**. The day bears a corresponding name in the other Germanic dialects.

TUFF, or **TUFA**, a rock formed from the ash or powder ejected from a volcano, mixed with the lapilli, or small fragments of lava. It may be arranged under the air, and remain quite loose, or be cemented by the percolation of water charged with mineral matter, by pressure or other cause. Sometimes the materials are arranged under water, and then the tuff contains organic remains, like other aqueous rocks.

TUFTS, COTTON, 1734-1815; b. Medford, Mass.; graduate of Harvard university, 1749; studied medicine and settled in Weymouth, Mass. He was one of the founders of the Massachusetts medical society; its president, 1787-95; also one of the original members of the academy of arts and sciences. He made a vigorous appeal to the patriotism of his fellow citizens in his instructions relative to the stamp act, 1765. He was representative to the general court, member of the governor's council, state senator, and delegate to the convention which ratified the U. S. constitution. He married a daughter of col. John Quincy, aunt of the wife of president John Adams.

TUFTS COLLEGE, Medford, Mass., founded by the Universalists and first opened to students in 1855. Its endowment, a part of which is in real estate that for the present is unproductive, is estimated at \$1,000,000. It has an annual income of \$40,000. It has excellent buildings, standing upon a tract of college land one hundred acres in extent. It has well appointed chemical, physical, and natural history laboratories, and an admirable cabinet of minerals, but as yet no considerable art collection. The library contains 19,000 vols. and 6,000 pamphlets. The college has three departments—1. the college proper; 2. department of engineering; 3. the divinity school. The latter has three professors, one instructor, and one lecturer. The course of instruction does not differ essentially from that of other New England colleges of the first rank. Number of professors in all departments (1880); 14, of students, over 100. Elmer H. Capen, D.D., president.

TUILERIES, PALACE AND GARDENS OF THE, were situated in the middle of Paris, on the right bank of the Seine, with Rue de Rivoli running along their n. side, and Quai des Tuileries to the south. Here, in 1342, a certain Pierre des Essarts possessed a pleasure house, called the *Hôtel des Tuileries*, on account of its being built in a locality outside the city where there were several tile-works (*tuileries*). Francis I. bought this property from the Sieur de Villeroy, as a present to his mother, the duchess of Angoulême. It was afterward chosen by Catharine de' Medici as the site of a new palace instead of that of Tournelles, and the building was begun in 1566. Originally, the palace consisted of only the square structure in the middle; but was greatly enlarged by Henry IV., Louis XIII. and XIV., Napoleon I.; and received still further improvements at the hands of the emperor, Napoleon III. Louis XIII. was the first sovereign who resided at the Tuileries. Louis XIV. only stayed there for a short time, and then established himself at St. Germain; Louis XV. and XVI. lived at Versailles. In 1793 the national convention held its sittings in the Tuileries; and Bonaparte chose it for his official residence. It was occupied by Louis Philippe, was the imperial residence of Napoleon III., and was burned by the commune in 1871.

TUKE, DANIEL HACK, b. York, England, about 1820; visiting physician to the York retreat for the insane, subsequently medical practitioner at Falmouth. He has written many essays on the treatment of insanity for scientific periodicals. He wrote a *Prize Essay on the Progressive Changes which have taken place, since the time of Pinel, in the Moral Management of the Insane* (1854); *The Asylums of Holland, their Past and Present Condition* (1854); *On the Canon of the New Testament* (1860). Associated with Dr. John C. Bucknill, he wrote *A Manual of Psychological Medicine* (1858, 2d ed. 1862).

TUKE, WILLIAM, 1733-1822, b. England; a Quaker in religion, and noted for his benevolence. In 1793 he founded the York retreat for the insane, the first English asylum where patients were treated like unfortunates rather than as brutes. His *Biography* was published in 1856 by Dr. Daniel H. Tuke, his great-grandson.

TULA. See **TOULA**.

TULA-METAL, a peculiar alloy, made of silver, with small proportions of copper and lead. It is manufactured at the imperial metal-works at Tula, or Toula, in Russia, and

is used for making the celebrated Russian snuff-boxes, erroneously said to be made of platinum.

TULARE, a co. in central California, 5,000 sq.m.; pop. '80, 11,281—9,891 of American birth, 524 colored. In this co. is Tulare lake, 33 m. long and 22 m. wide, and mount Whitney and Kaweah peak of the Sierra Nevada mountains; among the forest trees is the *sequoia gigantea* reaching the height of more than 275 ft. Co. seat, Visalia.

TULIP, *Tulipa*, a genus of plants of the natural order *liliaceæ*, having an inferior bell-shaped perianth, of six distinct segments, without nectaries; a sessile three-lobed stigma, a three-cornered capsule, and flat seeds. The bulb is fleshy, and covered with a brown skin. About thirty species are known, mostly natives of the warmer parts of Asia. The name tulip is supposed to be derived from the Persian name *thouleban*, which also signifies a turban. The most famous of all florists' flowers is the GARDEN tulip (*T. gesneriana*), which is from 18 in. to 3 ft. high, with a smooth stem, bearing one erect, large flower; the leaves ovate-lanceolate, glaucous, and smooth. The tulip is a native of the Levant; it was brought from Constantinople to Augsburg by Conrad Gesner, in 1559, and was rapidly diffused throughout all parts of Europe. The varieties in cultivation are innumerable. The tulip mania of the 17th c. in Holland is noticed in the article FLORISTS' FLOWERS. The tulip is still most sedulously cultivated in Holland, especially at Haarlem, from which bulbs are largely exported. It is prized merely for the size and beauty of its flowers; its smell being rather unpleasant. Great attention is paid to the cultivation of tulips, not only in the gardens of the wealthy, but often in those of the humbler inhabitants of small towns and villages, in which beautiful beds of tulips may often be seen. Tulips succeed best in a light, dry, and somewhat sandy soil. Bulbs are planted in the end of October, or beginning of November, and the flowers are produced early in summer. Beds of choice tulips are protected in spring by hoops and mats; and in the flowering season an awning of thin canvas is spread over them, which greatly prolongs the duration of their beauty, as they are soon spoiled by exposure to strong sunshine. Tulips are propagated by offset bulbs, and new varieties are raised from seed.—Another species of tulip, cultivated in gardens is the SWEET-SCENTED tulip, or VAN THOL tulip (*T. suaveolens*), which has a short, hairy stem, and yellow or red flowers, inferior to those of the common garden tulip in beauty, but prized for their fragrance, and for appearing more early in the season. It is often cultivated in pots in windows. It is a native of the s. of Europe. The WILD tulip (*T. sylvestris*), a native of many parts of Europe and Asia, is admitted into the British flora, but is a very doubtful native of Britain. It is common in the woods and vineyards of Germany and the s. of Europe. It has a slender stem, narrow lanceolate leaves, and a somewhat drooping, fragrant, yellow flower. It develops offset bulbs at the end of fibres thrown out from the root, at some distance from the parent plant. Its bulbs are eaten in Siberia, although bitterness and acidity characterize the bulbs of this genus.

TULIP TREE, *Liriodendron tulipifera*, a beautiful tree of the natural order *magnoliaceæ*, a native of the United States of North America, having a stem sometimes 100 to 140 ft. high, and 3 ft. thick, with a grayish-brown cracked bark, and many gnarled and easily broken branches. The leaves are roundish, ovate, and three-lobed; the middle lobe obliquely truncated. The flowers are solitary at the extremities of the branchlets; they resemble tulips in size and appearance. The bark has a bitter, aromatic taste, and like that of all the *magnoliaceæ*, contains a bitter principle, called *liriodendrin*. It has been used as a substitute for Peruvian bark in intermittent fevers, and is a good tonic. The tulip tree is one of the most beautiful ornaments of pleasure-grounds, wherever it grows and flowers well, which, however, in Britain, it does only in the southern parts. It is now plentiful in many parts of the s. of Europe. In some parts of the basin of the Mississippi, it forms considerable tracts of the forests. The heart-wood is yellow, the sap-wood white. The timber is easily wrought, takes a good polish, and is much used for many purposes.

TULLAMORE, one of the capitals, and now the assize t. of King's co., Ireland, also the seat of a poor-law union, is situated on the grand canal, 59 m. w.s.w. from Dublin, with which it is connected by a branch from the Great Southern and Western railway. It stands upon what may be called a fertile island of the great bog of Allen, and has within the last half c. risen into some importance. The pop. amounted in 1871 to 5,179, mostly Roman Catholics. It is a place of considerable business, commanding, from its central position, the inland traffic of a very large and not unfertile district. A large trade in corn and agricultural produce is carried on with Dublin by the canal. There is a large distillery, as also extensive breweries and several tanneries; and Tullamore is the center of a busy cattle-trade. The schools, both conventual and national, are excellent, and numerous attended. There are a jail and court-house, barracks, Roman Catholic and Protestant churches, etc. A newspaper is published here every week. Within a few miles is situated the extensive Jesuit college of Tullabeg, which receives above 150 pupils.

TULLE, a t. of France, dep. of Corrèze, at the embouchure of the Solane into the Corrèze. It is for the most part badly built, but has some fine promenades, excellent quays and bridges, a Gothic cathedral, an episcopal palace, a theological seminary, a

communal college, an industrial college, a public library, and a theater. One of the suburbs of Tulle, called Souillac, is a national military manufactory, and the town is otherwise notable for its manufactures of leather, paper, cards, lace (known as *point de Tulle*), liqueurs and ironmongery. Some say that Tulle owed its origin to Roman fort called *Tutela*; and in the vicinity are certain undoubted Roman remains; others, however, think it dates from the 4th century A. D. The pop. in 1876 was 11,038.

TULLE, a kind of thin silk lace of a very open pattern and loose structure, usually in narrow widths, for dressing ladies' caps, etc.

TULLOCH, JOHN, D.D.; b. Scotland, 1822; educated at St. Andrews, and ordained at Dunbar in 1845 as a minister in the church of Scotland. He afterward studied theology in Germany; and in 1854 became principal of St. Mary's college in the university of St. Andrews, where he still (1881) remains. Among his works are: *Leaders of the Reformation* (1859); *English Puritanism and its Leaders*; *Rational Theology and Christian Philosophy in the Seventeenth Century* (1872); *Religion and Theology* (1875); and *Pascal* (1878).

TULLY, WILLIAM, 1785-1859; b. Conn.; educated at Yale college; studied medicine; and in 1815 settled in Upper Middletown, now Cromwell, Conn. Meeting at that place Dr. Thomas Miner, he adopted his views on the treatment of spotted fever, and in 1823 published in association with him *Miner and Tully on Fever*. In 1824 he was chosen president of and professor of materia medica in the medical college at Castleton, Vt. He held the same chair in the Yale medical school, 1830-41.

TULTCHA, or **TULTSHA**, a t. in Bulgaria, European Turkey. It is built on the site of the ancient *Ægissus* on the right bank of the Danube; pop. about 13,000. It is 6 m. above the confluence of the Sulina and St. George's branches of the Danube, and has a good harbor, a citadel, and the ruins of a fortress damaged by the Russians. 1789-91. It was entirely destroyed in 1828; occupied by Russians, 1854. It has an important trade in salt fish, wool, and grain.

TUMBLER. See **LOCK**.

TUMERIL, in an army, a covered cart on two wheels, for the carriage of ammunition, tools, etc., belonging to the artillery. The name obtained a melancholy celebrity from being applied to the carts which served to carry the unfortunate victims of the French revolution to the guillotine.

TUMORS do not admit of a simple definition, but, in the words of sir James Paget, who has specially investigated this department of surgical pathology, they all belong to the class of overgrowths or hypertrophies, and their most constant distinctive characters are: (1) that they are deviations both in respect to size and shape from the normal type of the body in which they are found; (2) that they have an apparently inherent power and method of growth; and (3) that their development and growth are independent of those of the rest of the body, continuing with no evident purpose when the rest of the body is only being maintained in its normal type.

Tumors are usually divided into two chief groups, known as innocent or benign, and malignant tumors. The characters of the latter are sufficiently discussed in the article **CANCER**, and we shall therefore restrict our remarks to innocent tumors. These may be divided into *cystic tumors*, or cysts, and *solid tumors*; while the latter are subdivided into the *discontinuous* and the *continuous*; the discontinuous being those which are completely invested with a layer of tissue, which at once isolates them and connects them with the surrounding parts, while the continuous ones appear as growths, not in, but of the surrounding parts, and appear as *outgrowths*, as, for example, many polypi, and pendulous or sessile tumors. In accordance with these ideas, sir J. Paget classifies innocent tumors as follows: I. **CYSTIC TUMORS**: Cysts; which may be (A) *simple* or *barren* or (B) *compound* or *proliferous*. (A) *simple cystic tumors* include the varieties known as (a) *serous*, constituting what are termed *hydromata*, (b) *synovial*, (c) *mucous*, (d) *sanguineous*, (e) *oily*, (f) *colloid*, (g) *seminal*. (B) *Compound or proliferous tumors*, including (a) *complex cysts*, (b) *cysts with glandular or other vascular growths*, (c) *cutaneous cysts*, (d) *dentigerous cysts*. II. **SOLID TUMORS** and **OUTGROWTHS**, including (a) *fatty or adipose*, (b) *fibro-cellular*, *areolar*, etc., (c) *fibrous*, *fibro-muscular*, (d) *cartilaginous*, (e) *myeloid* or *marrow-like*, (f) *osseous*, (g) *glandular*, and (h) *vascular*.

Of these various species we shall only notice a few of the most important. *Cutaneous cysts* may be congenital or acquired. They may be found under the skin of any part, but sir J. Paget regards them as probably a hundred times more common in the scalp than in any other part. Their rate of growth is uncertain. When they grow rapidly they are apt to ulcerate, and hence are derived most of the so-called "horns" of the scalp and face.

Cutaneous cysts are usually formed either by the morbid growth of natural ducts or follicles, or by the enormous growth of elementary structures, which increase from the form of cells and nuclei, and become closed sacs with organized walls capable of producing other growths. A hair follicle or a sebaceous gland of its duct become obstructed, is thus often the origin of a cyst. Cutaneous cysts may be treated in various ways. Those in which the skin over their chief prominence is marked with a small dark point, through which a fine probe may be passed into the cavity, may be gradu-

ally emptied by dilating their openings, and pressing out their contents; or they may be extirpated by caustic or the knife.

Fatty tumors are the most frequent of all innocent tumors, and are often described under the name of *lipoma* and *steatoma*. They do not differ materially in structure from the ordinary fat of the adjacent parts, and seldom cause much annoyance, except from their unseemly appearance. No good cause can be assigned for their formation, but they may sometimes be traced to a blow or friction, as of a strap. The age at which they most commonly show themselves is at about forty. They may occasionally be absorbed by the prolonged internal use of liquor potassæ; but this treatment is almost certain to disturb the general health, and, as a general rule, excision is the proper treatment. *Fibro-cellular tumors* are remarkable for the rapidity of their growth (three or four pounds in the year, and, in one case recorded by sir J. Paget, a pound a month), and the weight which they may attain (sometimes forty pounds or more). The most common seat of these tumors are the uterus, the scrotum, the bones, the subcutaneous tissue, the lobules of the ear, etc. Polypi of the uterus, nose, etc., belong to this class. Except in the case of polypi, excision is the only available remedy; and in some parts of the body this is of course impossible.

We will conclude with a reference to a remarkable class of cases which often sadly puzzle the inexperienced surgeon. They are known as *phantom tumors*, and are apparently due to contraction of the muscles. "The abdominal muscles of hysterical women are most often thus affected; sometimes with intentional fraud. The imitation of a tumor may be so close as to require great tact for its detection, but chloroform, by relaxing the muscles, dissipates the swelling. Occasionally these apparent tumors move."—Paget on "Tumors," in Holmes's *System of Surgery*, vol. i., an article containing an excellent abstract of the most recent knowledge on the general subject of tumors.

TUMORS (ante). The frequency of the occurrence of tumors, the great variety of them, and their various relations to the constitutional condition of the subject in which they are developed, make them of great importance, not only to the surgeon, but to all who are liable to be afflicted with them, and a more or less general knowledge of them should constitute a part of the education of every intelligent person. According to Dr. John Hunter (1728-1793, q.v.), a tumor is a "circumscribed substance produced by disease, and different in its nature and consistence from the surrounding part," and this general definition by a master-mind, although not strictly correct in the light of modern pathology, is sufficient for our purpose. It may be well to add what has been proposed by one of the first of modern surgeons as an amendment, if for no other purpose than to show how little more can be added. "By a tumor may also be meant a more or less circumscribed mass, growing in some tissue or organ of the body, and dependent on a morbid excess of, or deviation from, the nutrition of the part." Tumors may be considered under two heads, viz., local hypertrophies, or outgrowths of the normal structure of the part, and of new formations presenting structural characters; differing more or less from those of the parts around. The tumor thus formed grows by an inherent force of its own, without regard to the growth of the rest of the system, obeying, however, the general laws of growth which govern the organism in which they are developed.

A classification of tumors may be made from their anatomical structure, or from their vital and clinical characters. As stated in the preceding article, surgeons have for a long time divided tumors into *malignant* and *non-malignant*, but this division is not scientifically exact. Some tumors, as cancers, are always essentially malignant, and others are always benign, as certain cysts; but there are many that are usually benign or non-malignant, which, however, from causes yet unknown may take on malignant characters. Such are termed semi-malignant. Non-malignant tumors are local in their development, and are often described as having no hereditary connection. This, however, is frequently not so, as it is well known that cystic tumors, particularly of the scalp, are known by common observation to be often hereditary. But notwithstanding they may be hereditary they are properly considered as local, because the constitution of the individual does not appear to be affected any more than where other peculiarities, such as double fingers and moles, are inherited.

From these growths malignant tumors have a wide difference. They are usually characterized by great luxuriance of development of a rather low character, a luxuriance termed vegetative, and are very liable to undergo, especially in their central parts, degeneration, ulceration, and gangrene. They represent a very great departure from the normal nutrition of the part, and as a rule indicate a fault, although it may be but little manifested outwardly, in the general nutrition of the body. Malignant tumors are often called heteromorphous, and this is true to a certain extent, but not so far as to signify that the new product is formed entirely on a new type, for the doctrine of Virchow, that "the same types of anatomical structures exist in new formations as are found in the body generally" is not disputed by the majority of pathologists. Briefly stated, the following are the principal signs in malignant tumors: It is at first small and usually with a distinct outline. There is a constant tendency to extension by local infiltration into the adjoining parts, by absorption, by incorporation into their substance,

and by deposit of the new elements in their place, and this process is continuous; often very slowly, as in hard cancer of the breast, but in many cases, in certain situations, rapidly, as in soft cancer, the rapidity being usually the measure of the malignancy. The extent of the growth is unlimited, that is to say, it may attain any size consistent with the life of the subject; but when a certain extent is reached, depending on the constitution of the patient, the central parts undergo fatty degeneration, and when this degeneration reaches the surface there is rapid sloughing or ulceration toward the center, causing profuse discharges which are usually very offensive, and often accompanied by hemorrhage. After a time, which varies considerably, the lymphatic glands which lie in the course of the lymphatic circulation, become enlarged and hardened in consequence either of a deposit of morbid elements, or from congestion of the glandular structure produced by a morbid condition of the fluids which pass through them. This affection of the glandular system constitutes what is called the secondary form of the disease, in contradistinction to the primary tumor. This lymphatic complication may occur before the skin is affected, but almost invariably soon after that occurrence, and the pathological condition of the glands as revealed by the microscope are the same as that of the primary tumor. After the lymphatics are affected the internal organs, particularly the lungs and the liver, become the seat of secondary deposits, which, however, may differ somewhat in character from the primary tumor, and these deposits then become the foci of further development of the elements of the disease, which have an increased rapidity of growth; in other words, an increased malignancy. After the lymphatic glands are affected constitutional symptoms appear, such as sallowness, disturbance of digestion, wasting of the body, and general anæmia. Most malignant tumors are cancerous, but not always, although cancers are always malignant. Other malignant tumors are sarcomas.

Tumors may be divided into five classes. 1. *Cystic tumors*, which may be again divided according to their contents into what are called (a) dermoid cysts, having their commencement in the derma, or skin, including three varieties; those containing epidermis; those containing true skin, hair, and glands; those containing cartilage, bone, and teeth. See *Cutaneous cysts* in TUMORS, *ante*. (b) Serous cysts, occasioned by dilatation of sacs, cavities, or canals, including blood-vessels, most frequently situated about the neck, but met with in almost every situation. They are lined with flat endothelium (epithelium), like that lining serous cavities generally. See SEROUS MEMBRANES, *ante*. A variety of serous cysts called multilocular (many-celled) are frequently met with in the ovaries, and constitute one form of ovarian dropsy or tumor. The ovarian cyst may also be unilocular (one-celled). Sanguineous cysts (hematoma) are a peculiar variety which have been well described by sir James Paget as chiefly occurring about the neck, parotid gland, and anterior part of the thigh, leg, and shoulder. They contain fluid blood more or less altered. They may be formed in three ways: by hemorrhage into a previous serous cyst; by transformation of nævus (q.v.); or by occlusion of a vein. (A peculiar form of hematoma of the ear is often met with in the insane). The term hematoma is also applied to those cysts which result from changes taking place in extravasated blood, as in the brain. Other serous cysts are formed by accumulation of fluid in the meshes of the areolar tissue, and by changes in the products of inflammation. (c) Colloid cysts, arising from colloid (gluey) degeneration of pre-existing cells, and from colloid degeneration of new cells. Other cysts are formed by the development of parasites, the most common of which is the hydatid cyst arising from the presence of the young of *tenia echinococcus*. 2. *Tumors composed of one of the modifications of fully developed connective tissue*, such as fatty tumors (lipoma,) fibrous or fibroid tumors, and fibro-cellular tumors (fibroma), cartilaginous tumors (chondroma, see ENCHONDROMA, *ante*), bony tumors (osteoma, exostosis). The causes of *exostosis* are obscure. In some instances they are hereditary. The disease is usually met with at about the age of puberty. There are two modes of development; primarily as true bone, and secondarily from previously formed cartilage. Exostosis may be simple or multiple, and are of two kinds, hard, or *ivory exostosis* and *spongy, or cancellous exostosis*. Another variety of these tumors of the second class is *myxoma* or mucous tumor. This has been classed by some writers as a variety of sarcoma. Many tumors formerly described as colloid cancer belong to this class. These tumors usually appear in the form of round, oval, or lobular masses surrounded by a loose capsule of connective tissue. They are elastic and gelatinous, and of slow growth. When cut they present generally a delicate pink color, but are sometimes yellow, and pour out an abundance of a glairy, tenacious fluid resembling gum water. A microscopic examination shows a beautiful arrangement of branched cells and net-work. Virchow regards these tumors as closely related to embryonic fat. 3. *Tumors which resemble in structure more or less perfectly one of the more complex tissues of the body*. One variety of these is myoma, or muscular tumor. There are two classes, one containing striated, and the other non-striated, muscular fiber. Belonging to this class are *neuromas*, or nervous tumors, rare growths when strictly growing out of nervous tissue. They are always non-malignant, and should never be interfered with except when giving pain. *Angiomas* are tumors composed of vascular tissue of new growth; one variety is *nævus* (q.v.) Other tumors of this class are *lymphangioma*, a tumor composed of lymphatic vessels; *lymphadenoma*, one composed of tissue like that in the lymphatic glands, and *papilloma*,

a tumor resembling the papillæ of the skin or mucous membrane, and including such growths as corns and warts (q.v.). 4. *Tumors composed of tissue which is either purely embryonic, or as showing some signs of a tendency to develop into adult tissue of the connective type.* These tumors comprise the *sarcomas*, or sarcomata, growths which have been the subject of much controversy, but whose classification is now pretty well settled. Many until recently were known under a variety of names, and grouped in other divisions. Formerly the term sarcoma was applied to almost any soft fleshy growth. The soft sarcomata of bones and of secreting glands and lymphatics were formerly called soft cancer, and melanotic sarcomata were called melanotic cancer. Hard, firm sarcomata were often described as hard cancer or scirrhus. The tumors described by sir James Paget as fibro-plastic, fibro-nuclear, recurrent-fibroid, etc., have all been brought into the great class *sarcoma*. These tumors may grow in any part of the body, and present every variety of consistence, color, and form; they may be circumscribed or diffuse, and as benign, as a fatty tumor, or as malignant, as the worst form of cancer. The anatomical type of sarcoma is found in the embryonic tissue. See DEVELOPMENT OF THE EMBRYO, *ante*. Its pathological type is seen in the cellular products of inflammation, with the particular difference that inflammatory new growths tend to limit themselves, whereas sarcomata have a tendency to indefinite growth, and the individual elements (cells) are often much larger, and have less tendency to form tissue. It is chiefly according to the size and form of the cells that sarcomas are divided into varieties. We have space here to scarcely more than mention the names of these varieties. *Small round-celled sarcoma*, or granulation sarcoma (formerly called encephaloid cancers), and resembling superficial layers of granulations in healing wounds, being composed of small round cells about the size of white blood-corpuscles. *Spindle-celled sarcoma*, formerly called recurrent-fibroid tumor, and fibro-plastic tumor, a growth composed of spindle-shaped, fusiform cells, either lying in contact or separated by a homogeneous or fibrous intercellular substance, the cells varying greatly in length, from $\frac{1}{1000}$ to more than $\frac{1}{100}$ of an inch. *Oval-celled sarcoma* is a variety of spindle-celled, of very rapid growth and great malignancy. *Myeloid, or giant-celled sarcoma*, formerly classed as fibro-plastic, and sometimes as soft cancer, and by Abernethy called *albuminous sarcoma*, whose peculiar characteristic is the presence of large, many-nucleated masses of protoplasm, resembling the cells found in the marrow of fetal bones. The cells are sometimes $\frac{1}{100}$ to $\frac{1}{50}$ of an inch in diameter, and of irregular shape, the nuclei varying from ten to forty in number, of oval shape, and having highly refracting nucleoli. These myeloid cells are imbedded in masses of spindle-shaped or roundish cells. These tumors are extremely vascular. *Ossifying and osteoid sarcomata*, formerly called bone, or osteoid cancer. Almost any form of sarcoma may undergo ossification, the varieties already mentioned often showing abundant formation of bone. *Alveolar, or large round-celled sarcoma*, occurring chiefly in the skin, bones, and muscles, and difficult of distinction from hard cancer. *Melanotic sarcomata*, or *melanosis*, formerly regarded as *melanotic cancer*, was carefully studied by Carswell, and arranged under the heads *punctiform melanosis*, *tubertiform melanosis*, and *stratiform melanosis*. These growths are usually of the spindle-celled variety, but contain large numbers of round or oval, and fusiform cells. The spindle-cells are large, and there is no fibrous material. The pigment consists of a brown granular matter in the interior of many of the cells, while the remainder are colorless. They are usually developed in those situations where pigment naturally exists, as in the skin, and the choroid coat of the eye-ball, but sometimes are found in the lymphatic glands. They are of rapid growth, and usually occur in middle life. They are among the most malignant of tumors, and the secondary deposits occur in every part of the body, being distributed either by the vascular system alone, or by both blood-vessels and lymphatics. If a melanotic sarcoma has reached the size of a filbert it may be concluded that secondary deposits have already taken place, and that the disease has reached a rapidly fatal stage. Of other forms of sarcoma there is no space for mention. This brings us to the consideration of the last class of tumors. 5. *Tumors composed of cells of an epithelial type arranged in spaces in a stroma consisting of more or less perfectly developed fibrous tissue.* This group constitutes the *cancers* or *carcinomas*. See CANCER, *ante*.

TUMULTUOUS ASSEMBLAGES are, in point of law, in the category of riots, and were carried to an enormous height in the reign of Charles I. It was afterward enacted by a statute of 13 Ch. II. c. 5, that not more than twenty names should be signed to any petition to the crown or either house of parliament for any alteration of matters established by law in church or state, unless the contents be previously approved by three justices or a grand jury; and no petition should be delivered by a company of more than ten persons. A later statute of 57 Geo. III. c. 19, made it unlawful to convene a meeting of more than fifty persons, or for more than fifty to meet in any street within a mile of Westminster hall for the purpose of considering any petition or complaint to either house of parliament, for alteration of matters in church or state, on any day when parliament is sitting. But the act does not apply to meetings to elect members of parliament. Other enactments were passed as to assemblies of persons collected under pretext of public grievances, but these were temporary, and have now expired.

TUMULUS. See SEPULCHRAL MOUND.

TUN, a word which, under various modifications, exists in the Celtic and Teutonic languages, seems connected with the Latin *teneo*, I hold, or the Greek *teino*, I stretch, and signifies primarily a large vessel or cask. In various countries, Britain included, it denotes also a liquid measure of capacity; in old ale and beer measure, the tun was equal to 216 gallons (each gallon = 282 cubic in.), in old wine measure it was equal to 252 gallons (each gallon = 231 cubic inches). The tun and all other liquid measures of higher denomination than the gallon are no longer legal; but the names are, for convenience, still retained. These denominations had their origin in the natural practice of giving names to casks in common use which preserved a uniform size. As a tun of water weighs a little more than 2,000 lbs., it is probable that the ton weight (see *Tox*) was taken from the tun measure.

TUNBRIDGE, a market-t. in the co. of Kent, stands on the Medway, on ground rising from the banks of that river, 27 m. s.e. of London. The castle, which stands on the Medway, near the entrance of the town, dates from the close of the 13th c., has a noble gate-tower of great size, richly ornamented, and is at present occupied as a military training school. The parish church is a large and old, but sadly disfigured building; but the chief establishment of the town is the grammar-school, of which the revenues are very considerable. Attached to it are 16 exhibitions of £100 a year, tenable at either university, besides 12 lesser exhibitions. The manufacture of toys and turned and inlaid articles of wood (see next article), is a specialty. Pop. '71, 8,209.

TUNBRIDGE-WARE, a kind of wood manufacture carried on at Tunbridge and Tunbridge Wells. It consists of such articles as ladies' work-boxes, ring-boxes, desks, etc., which are covered with a veneer characteristic of this industry, and formed from small pieces of wood of square and triangular shape in transverse sections, built up in geometric patterns; these are carefully glued together so as to form a solid mass, from which thin transverse veneers are cut, and are used to cover the articles made. This trade was formerly of much greater importance than at present.

TUNBRIDGE WELLS, a famous English inland watering-place, and after Bath, the oldest in the country, stands on the s. border of Kent, 5 m. s. of Tunbridge. The town which is rapidly extending, occupies the head and slopes of one of the valleys of the Weald, and has in general a s.w. aspect, commanding very fine views. The three centers of population are mounts Ephraim, Sion, and Pleasant, separated by a large common and cricket ground. The waters are chalybeate. The wells, discovered in 1606 by lord North, are situated at the end of a promenade called the *pantiles*. In the vicinity are charming rides and walks. The fashionable season is June, July, August, and September. Tunbridge-ware is also largely manufactured here. Pop. '72, 19,410.

TUNDRA (in Finnish, *tuntur*—that is, mossy flat) is the Russian name for the vast plains which border on the Arctic ocean in Siberia, and also westward from the Ural along the n. of Europe. They are swampy tracts of land, partly covered over with a thick felt of bog-moss, and partly with a dry snow-white covering of reindeer-moss and different kinds of lichens. It is only the reindeer that renders this frightful waste habitable for the wandering hordes of Samoyedes, who hunt the furred animals as well as the swans and wild geese which in summer flock hither in vast numbers. These polar steppes, however, can be trodden only in winter, when the whole region is one sheet of frozen soil and ice. In summer, when the surface thaws, the greater part of the region becomes an inaccessible morass, except a portion along the n. coast of Siberia, which retains its snow covering throughout the year.—See Schrenk, *Reise nach dem Nordosten des Europ. Russland durch die Tundren der Samoyeden* 1837 (Dorpat, 1848).

TUNE, a short popular melody; also, that property of musical sounds by which they stand to each other in the relation of pitch (q. v.).

TUNGSTEN (symb. W, equiv. 92—in new system, 184—sp. gr. 17.6) is a rare metal, which derives its name from the Swedish words *tung*, heavy, and *sten*, a stone. It is chiefly derived from wolfram (whence the symbol W), which is a tungstate of iron and manganese, and likewise occurs in schleelite, which is tungstate of lime. It is unnecessary to describe the means of separating the metal, which may be finally obtained either as a dark-gray powder or in heavy iron-gray bars, which are very hard, and difficult of fusion. Aqua regia and nitric acid convert it into tungstic acid. When 10 parts of this metal are alloyed with 90 of steel, a mass of extraordinary hardness is obtained.

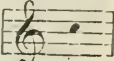
Tungsten forms two compounds with oxygen, viz., a binoxide (WO_2), which is obtained in the form of a brown powder, by heating tungstic acid to low redness in a current of hydrogen, and which does not form salts with acids; and an acid teroxide, known as *tungstic acid* (WO_3). Independently of *tungstic anhydride*, there are two modifications of this acid, represented by the formulæ HO, WO_3 , and HO, W_2O_6 , which are known as *tungstic* and *metatungstic acids* respectively. Various tungstates have been formed and examined. Of these, the most singular is tungstate of tungsten (WO_2, WO_3), which is of a splendid blue color; and tungstate of soda, which answers admirably as a means of preventing muslin, etc., from bursting out in a flame when brought in contact with fire. It is unnecessary to notice the metatungstates, or the sulphides, chlorides, etc., of tungsten.

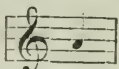
TUNGÛS, an ethnographic group of the Turanian family, are at the present time situated to the n. and e. of the Mongol group, inhabiting the vast plains stretching s. from the icy sea of Siberia, between the Yenesei and the Lena, the northern slopes and valleys of the Great Altai, and the hilly uneven tract between the upper Ameer and the Lena. The chief peoples included under this group are the Niuju, the Däurians, Tshapodshirs, Manchûs (in the s.e.), and Lamûts (on the e. coast). In the n. they have intermingled with the Samoyedes; in the w. with the Ostiaks, whose territory is on the other side of the Yenesei; and in the s., the Manchûs, though being gradually pushed northward by the Chinese, have for a long time exercised undisputed sway over their supplanters. Divided politically between Russia and China, the southern portion of them are Buddhists, while the tribes further n. mostly practice Shamanism (q.v.), a few having, by the strenuous exertions of the Russian government, been induced to profess Christianity. The Tungûs are partly nomad and wandering, and partly agriculturists and settled rearsers of cattle. The first of these are commonly classed according to the districts they prefer to dwell in, as Tungûs of the forests, or Tungûs of the steppes: the former being shepherds, hunters, or fishers; and the latter exclusively shepherds. The steppe Tungûs, again, are divided according to the animals of draught they employ, into the reindeer-Tungûs, the horse-Tungûs, and the dog-Tungûs. The Tungûs are in general robust and lively, with flat visage and small eyes, the latter characteristics, however, being much less prominent in them than in the Kalmucks. A portion of the Chinese Tungûs constitute the Ssolon nation so celebrated as warriors in Chinese modern history. The Tshapodshirs tattoo their faces.

TUNICA, a co. in n.w. Mississippi, having the Mississippi river for its w. boundary; 850 sq.m.; pop. '80, 8,461—8,402 of American birth; 7,205 colored. Co. seat, Austin.

TUNICA TA, a class of acephalous mollusks, having the body inclosed not in a shell, but a soft elastic tunic, which is perforated by two apertures, and is composed of a substance resembling cellulose (q.v.). The tunicata are extremely numerous, and are found in all seas. The *ascidiæ* (q.v.) belong to this class, and the *sulpidæ* (q.v.).

TUNING-FORK, a contrivance for regulating the pitch of the voice or of a musical instrument. It consists of two prongs of steel springing from a handle, and so

adjusted as to produce a fixed note when struck. It is usually tuned in C 

in Britain, and in A  in Germany. In consequence of the absence of any

universally recognized standard, there is even in this country a considerable variety in the pitch of the tuning-fork. Messrs. Broadwood employ three forks of different pitch to tune their piano-fortes; one corresponding to the phillharmonic standard of 30 years back for instruments used for the accompaniments at ordinary concerts; another somewhat higher for piano-fortes meant to take part in orchestral compositions; and a fork of still higher pitch, adopted for the present opera and phillharmonic standard, which is about a semitone higher than the standard of 30 years ago. A fork has lately been invented in Germany capable of adjustment to different standards of pitch, by means of a moveable brass slider, fitted with a screw, there being indications on the prongs of the positions of the slider which give the pitch adopted by the principal orchestras in Europe.

TUNIS, a country of Africa, and one of the Barbary States, is bounded on the n. by the Mediterranean, on the w. by Algeria, on the s. by the Desert, and on the e. by Tripoli and the Mediterranean. Its greatest length from n. to s. is about 440 m.; its average breadth, 160; area, upward of 45,000 sq.m.; pop., according to latest authorities, 2,000,000. Tunis is traversed by branches of the great Atlas range, which in fact, has its proper termination here. The northern coast is rocky and steep, with numerous bays, of which the largest is the gulf of Tunis; and two of its promontories, capes Blanco (*Râs-el-Abid*) and Bon, are the most northern in Africa. The eastern coast, on the other hand, is flat, sandy, and infertile, like that of Tripoli, but has two large gulfs, Hammamet and Cades (the *Syrtis minor* of antiquity). The southern part of Tunis belongs to the desert steppe known as Belud-el-Jerid. There is only one fresh-water lake of any consequence, that of Biserta or Bensart, near the n. coast. The brooks and torrents of Tunis either lose themselves in the sand, or find their way to the sea after a short course. None are navigable. The longest is the Mejerdah (the *Bagradas* of the ancients), which flows in a generally north-eastern direction into the gulf of Tunis. Other streams are the Ved-el-Milianah and the Ved-el-Kebir. There are several mineral springs in the country. The climate of Tunis is fine, and the soil exceedingly fertile, so that, in spite of a very poor knowledge of agriculture, wheat, barley, maize, dhurra, pulse, olives, oranges, figs, grapes, pomegranates, almonds, and dates are abundantly produced. The culture of oil is more attended to, and is very lucrative. Great herds of cattle are fed on the plains; the sheep are famous for their wool; and the horses and dromedaries are no less celebrated. The chief mineral products are sea-salt, saltpeter, lead-ore, and quicksilver. In the vicinity of the sea-coasts, considerable manufacturing

and trading industry is manifested, more particularly in the cities of Tunis and Susa. Wool, olive-oil, wax, honey, soap, hides, coral, sponges, dates, wheat, and barley are the principal exports. Cloth, leather, silks, muslin, spices, cochineal, and arms are transported by caravans to the interior of Africa, whence are brought for export to Europe, etc., senna, gums, ostrich-feathers, gold and ivory. In 1876 the exports were of the value of £687,680; the imports, £473,650.

The predominant race is of Arabic descent, but there are many Berbers, especially in the interior. The territory of Tunis, corresponds pretty nearly with that of ancient Carthage; and for a sketch of its pre-Christian history the reader is referred to the articles CARTHAGE, ROME, HANNIBAL, HAMILCAR, SCIPIO, JUGURTHA, etc. Its subsequent fortunes, down to 1575 are interwoven with the general fortunes of Barbary (q.v.); but in that year, Sinan Pasha conquered and incorporated it with the Ottoman empire, and gave it a new constitution. The government was placed in the hands of a Turkish pasha, a divan or council, composed of the officers of the Turkish garrison, and the commander of the Janizaries. After a few years, however, an insurrection of the soldiery broke out, and a new government was established, the head of which was a "dey," possessing very limited authority; the chief power being at first exercised by the military divan. Gradually, however, an officer with the title of "bey," whose original functions were confined to the collection of tribute and taxes, acquired a supremacy over the other authorities, and finally obtained a kind of sovereignty, which Murad bey succeeded in making hereditary. The family of Murad bey ruled in Tunis for 100 years, and gained considerable renown both by their conquests on the mainland, and their piratical enterprises against Christian powers at sea. During the 18th c., it became tributary to Algiers. About the beginning of the 19th c. Hamuda pasha threw off the Algerian yoke, subdued the Turkish militia, and created a native Tunisian army; in consequence of which Tunis virtually attained independence. The recent rulers, Achmet bey (1837), Mohammed bey (1855), and Mohammed Sadyk bey (1859), have proved liberal, enlightened, and reforming sovereigns. By a firman of Oct. 25, 1871, the sultan renounced the tribute formerly exacted, and fixed the future relations of the sublime porte to Tunis. The "bey" is to receive his investiture from Constantinople; without the sultan's authority he can neither declare war, conclude peace, nor cede territory; the sultan's name must appear on all the coinage, the army must be at the disposal of the porte. In internal matters, however, the power of the bey remains absolute.

TUNIS (*ante*). In the spring of 1881 the government of France resolved to put an end to the repeated invasion of Algerian territory by plundering bands from Tunis. It was asserted by the French press that the invasion of French rights was not discouraged by the Italian consul, signor Matteo. On the recurrence of border outrages the French troops under gen. Bréard crossed the frontier of Tunis. Skirmishes ensued, in which the badly-drilled Kroumirs, native troops, proved no match for the French, and were soon driven back to the mountains. The invading troops approached and surrounded the capital, and May 12, 1881, the bey was induced to sign a treaty, in ten articles, of which the main provisions are said to be, that there shall be a French minister resident in the capital to guard French interests; that several positions on the coast shall be occupied by the French, including, it is reported, Soosa, Goletta, and Ben-menter; and that France shall in certain matters regulate Tunisian finances. This treaty has caused some indignation among the other powers, especially Italy and the Porte, the latter claiming a suzerainty over Tunis which is not practically evidenced.

TUNIS, capital of the African state of the same name, lies on the west side of a small lake or lagoon, near the s. w. extremity of the lake of Tunis, about three m. from the ruins of ancient Carthage. It occupies rising ground, and both the city proper and the suburbs are surrounded by walls. The streets are narrow, unpaved, and dirty, but the bazaars are well furnished and many of the mosques are really splendid, particularly the mosque of Jussuf, which has beautiful marble pillars. The palace of the bey is probably the finest building in Tunis; the ceilings glitter with gold and carmine and azure. All the principal rooms open into a large court-yard paved with marble, and surrounded by arcades supported on marble columns, while fountains everywhere diffuse a perpetual and delicious coolness. The citadel, begun by Charles V., and finished by don John of Austria, is interesting from its collection of old arms, and was formerly the great slave-prison of Tunis. There are also Roman Catholic and Greek churches, Jews' synagogues, an Italian theater, and large barracks in Tunis. Tunis is the commercial center of the state. The imports in 1876 were £345,000, and exports £250,000. In the same year, 1024 vessels entered and cleared the port. Tunis has silk and woolen manufactures, as shawls, tapestries, mantles, burnouses, caps, turbans, colored cloths, also leather, soap, wax, and olive oil, all of which it exports, together with grain, fruits, cattle, fish, ivory, gold-dust, coral, etc. Pop. stated at 120,000.

The lagoon or lake of Tunis is shallow, and communicates with the *gulf of Tunis*, an inlet of the Mediterranean, by a narrow strait called the Goletta. The gulf itself is 45 m. broad at the entrance—between cape Bon and cape Farina—and extends inland for 30 miles. The anchorage is good.

TUNKERS, a religious sect, occupying settlements in New England, New York, Pennsylvania, Ohio, Indiana, etc., and thus pretty widely scattered throughout the

northern and middle parts of the United States. They are nowhere numerous, and are chiefly occupied in the cultivation of the soil. The name which they take for themselves is simply that of brethren, and they profess that their association is founded on the principle of brotherly love. The name Tankers is of German origin, signifying Dippers, and is due to their dipping in baptism. It is very commonly, by corruption, pronounced and written *Dunkers*. In the vicinity of their settlements they are generally known as the *Harmless people*. They derive their origin from a small village on the Eder in Germany, but have been an exclusively American sect since the beginning of last century, when they all emigrated to America. They were recently estimated to have over 500 churches, and some 50,000 members. They reject infant baptism, and have no ministers specially devoted to the ministry as a profession. Every brother is allowed to stand up in the congregation and exhort; and when one is found particularly apt to teach, he is ordained by laying on of hands with fasting and prayer, and is expected to devote himself in some measure to the ministry, although without any stipend or pecuniary reward, even if his own crops should suffer by his neglect of them. There are deaconesses as well as deacons among the Tankers. Like the Quakers, they use great plainness of dress and language; they refuse to take oaths or to fight; and they will not go to law. They celebrate the Lord's-supper, and accompany it with love-feasts, washing of feet, the giving of the right hand of fellowship, and the kiss of charity. They anoint the sick with oil in order to their recovery, depending upon this unction and prayer, and rejecting the use of medicine. They generally believe in the doctrine of universal salvation; but it is not a tenet of the sect. They do not insist upon celibacy as an absolute rule; but they commend it as a virtue, and discourage marriage. They are industrious and honest, and universally held in good repute among their neighbors.

Sole dependence upon prayer for the cure of the sick is the characteristic also of a small religious sect, of which a few members are to be found in England, calling themselves the *Peculiar people*. In Switzerland the name of Dorothea Trudel (d. 1862) was long famous for the cure of ailments by prayer. She did not, however, in all cases, refuse to call in medical advice. In Germany a Protestant pastor, Blumhardt, pursues a similar system on a large scale, and it is said with great success. See BAPTISTS, GERMAN.

TUNNEL. Tunnels are passages constructed under ground to carry roads, railways, canals, or streams of water. Tunneling, which has long been in use for roads, and aqueducts, has of late received a great development in the construction of railways. At the present time there are believed to be upward of 80 m. of railway tunnels in Great Britain in constant use for the passage of trains; and, as their cost averages from £45 to £50 per yard, a total of about seven millions sterling has been expended in their construction. In tunnels of considerable length, as the progress made by working from the two ends would be very slow, it is considered advisable to commence the work from many points of its length; for this purpose, shafts or pits are made at these points down to the level of the tunnel. Of these shafts, some are temporary, and only kept open during the progress of the work; others are permanent, and for the purpose of ventilating the tunnel when in use. These shafts have to be large enough to allow the ascending and descending skips or buckets containing the excavated materials to pass one another. For the temporary shafts, an elliptical shape is found to give the greatest room for this purpose at the least expense. Square shafts are to be avoided, on account of the difficulty of excavating the corners in rocky strata. As the shaft descends, its sides are lined with timber-planks, supported by strong timber-frames, about 5 ft. apart. The permanent shafts, when the material is not of rock sufficiently solid, are lined with brick-work or masonry, built in lengths, as the shaft proceeds downward. These permanent shafts are generally made circular in section, and it is found better to place them 3 or 4 yards from the side of the tunnel, communicating with it by a small passage. This is convenient in the construction, and also is a useful refuge for workmen subsequently during the passage of trains. These shafts are generally made about 10 ft. diameter. They are sunk a few feet below the floor of the tunnel, to form a pit for the collection of the water from the workings, which is hauled to the top in barrels or buckets. The raising of the excavations and the water, and the lowering of building materials, and of the workmen, is done by a windlass, a horse-gin, or steam-power, according to the extent of the work. On the completion of the shaft, the tunnel is commenced in both directions from its bottom; and in the case of ordinary rock, it is found convenient to commence by making a small adit, or passage, along from shaft to shaft, through the whole length of the tunnel; this is made six or seven ft. high, and the top of it placed at the level of the top of the tunnel. When this is completed, the correct center line is marked out in it throughout the tunnel; the adit is then enlarged to the shape and size of the arch of the tunnel, which is built in, and then the excavation is completed, and side-walls built up to underpin the arch. In cases where the material is soft and full of water, the full section of the tunnel is generally carried forward at once, and in such cases an invert has to be built between the side-walls, to withstand the upward pressure, as the pressure of soft material has the character of a fluid pressure, and presses the tunnel on all sides. The excavation is then done in lengths of about 24 ft., which is firmly secured with poling-boards and larch bars, and securely shored; the centers are

then set, and the brick-work built up. The timber bars are generally drawn out when the brick-work is carried up, and the holes they leave rammed tight with clay; but they have sometimes to be built in. When the quantity of water is very great, an adit is driven through the tunnel, at the level of its floor, before the work is begun, to allow the water to run off.

Tunnels are generally made straight, but sometimes they are curved; this is done that they may pass under the lowest part of the hill, in order that the shafts may be as short as possible. They are frequently constructed on steep gradients, but as the trains experience some resistance from the air in passing through them, it is advisable not to make them so steep as the gradients in the open air.

The most remarkable tunnel yet executed is the Mont Cenis* tunnel. This tunnel connects the railways of France and Italy, and is on the direct railway route from Paris to Turin. The length of this tunnel is 7 m. $4\frac{1}{4}$ furlongs. It is 434 ft. higher at Bardonnèche, on the Italian side, than at Modane, on the French side. On this account, it is on a gradient of 1 in 45 $\frac{1}{2}$ from Modane to the middle, and thence it falls 1 in 2,000 to Bardonnèche, this latter fall being sufficient to run off the water. The dimensions at Modane are 25 ft. 3 $\frac{1}{2}$ in. wide at base, 26 ft. 2 $\frac{1}{4}$ in. at widest part, and 24 ft. 7 in. high, the arch being nearly semi-circular. At Bardonnèche it is 11 $\frac{1}{2}$ in. higher. It is all lined with stone-masonry, except at the Bardonnèche end, where the arch is of brick.

The work was begun in 1857, and was at first done in the usual way by hand; but in 1861 the perforating machines described below were introduced on the Italian side, and two years later (1863) on the French side. On June 30, 1863, the tunnel had been driven 2,800 yds., and the rate of advancement was 9 $\frac{1}{2}$ ft. per day. All the efforts of the engineers to accelerate the work were for several years unavailing; and in Oct., 1866, just one-half the distance, or 6,680 yds., had been pierced, showing the same constant rate of 9 $\frac{1}{2}$ ft. per day. At this rate, the tunnel would not have been completed till 1872. Owing, however, to improved modes of working, and to a favorable change in the nature of the rock, the rate of advancement became greater toward the end, and the two parties met on Dec. 25, 1870. The tunnel was formally opened in Sep., 1871. A premium was to be paid by the French government to the Italian government, who did the work, for each year by which a term of 25 years, counting from 1862, was reduced. The French government were also to pay £1,287,000 for the construction of one-half the tunnel when completed.

This great work, which appeared almost impracticable to ordinary methods of tunneling by manual labor, was rendered practicable by machinery introduced by the engineers, Messrs Sommeiller, Grandis, and Grattoni. The great difficulty lay in the fact that, from the great height of the mountain, shafts were impracticable, and progress could only be made from each end. The ventilation also presented serious difficulties. M. Sommeiller perfected a small machine, weighing 6 cwt., which bored a hole $1\frac{1}{2}$ in. diameter and 3 ft. deep in twenty minutes; the time taken by two miners working by the ordinary method being two hours. Eleven of these machines were placed on a movable support, and were capable of working at almost any angle. Three or four large holes were bored in the center of the heading, and round these other holes of the ordinary size, in all 80 holes. The large holes were not fired, but were for the purpose of weakening the rock. The others were then fired in succession and in detachments, beginning with those nearest the center, and working outward. The machines were worked by compressed air acting, like high-pressure steam, on a piston in a cylinder; this air being compressed outside the tunnel by water-power acting on the hydraulic-ram principle, and also by an air-pump; it was used at a pressure of five atmospheres above the atmospheric pressure, and was conveyed to the workings by a pipe 7 $\frac{1}{2}$ in. diameter. After it had expended itself in working the borers, it escaped into the tunnel, and so ventilated the workings. The advanced heading was the only place where these machines were used; the enlargement of the tunnel to the full size, the building, etc., were all performed by manual labor. It was calculated that when the tunnel was completed there would be a constant current of air from the n. to the s. end, as the latter is the higher end, and in a situation more exposed to the heat of the sun. In view of the great importance of the Mont Cenis route, and the uncertainty of the time of completion of the tunnel, a locomotive railway was constructed in the mean time over the top of the pass. The rails were laid on the existing road, and ascended the hill in zigzag lines. The steepest gradient was 1 in 12, and on this gradient and down to 1 in 20, a third rail was laid in the center of the way, raised about 9 in. above the other rails. The engines were provided with two pairs of horizontal wheels, which being made to press against the center rail, provided the adhesion necessary for ascending and descending these steep inclines. A similar enterprise to the piercing of Mont Cenis has been begun in connection with the new railway by the St. Gotthard.

TUNNEL (ante). One of the most important tunnels in the United States is the Hoo-sac tunnel in Berkshire co., western Mass., owned by the state, is an important part of the Fitchburg railway from Boston to the west. The e. end of the tunnel is 137 m.

* This is really a misnomer; the tunnel is at a considerable distance from Mont Cenis, and the chief summit under which it passes is the "Grand Vallon" (11,000 ft. high).

from Boston. Some preliminary work was undertaken in 1851, but the actual cutting of the mountain did not begin till 1856. In 1862 the work came into the hands of the state, which brought it to completion. The tunnel is $4\frac{1}{2}$ m. long, running through micaceous schist, and of sufficient width to permit the laying of two railway tracks. The work of cutting was chiefly done by pneumatic drills. The entire cost of the tunnel is not easily stated, but with some 40 m. of railroad, it probably approached \$15,000,000. It is now in constant and successful use, and few lives have been lost in the work of its construction.—A subaqueous tunnel to supply the city of Chicago with pure water from lake Michigan extends 2 m. into the lake easterly, having two shafts, 6 and 7 ft. in diameter. Work was begun on the first shaft in 1864 and completed in 1867; the second was finished in 1874. On the crib, 2 m. in the lake, is a light-house and keeper's house. The entire cost of the city water-works up to 1874 was somewhat more than \$5,000,000. The chief difficulty encountered in the construction of this tunnel was from explosive gas, and several accidents occurred from this cause, none of which, however, were fatal. The quality of the water thus furnished to the city has been as a rule very good, though in the summer of 1881 unusual causes drove the city sewage for a short time to the mouth of the crib. Somewhat similar tunnels have been built at Buffalo, N. Y., and Cleveland, Ohio. The latter is 6,660 ft. long and 5 ft. in diameter. In its construction difficulties were encountered, as at Chicago, from volumes of inflammable gas, which from time to time entered it and exploded. Some lives were thereby lost. The work was begun in 1869 and finished in 1874, at a cost of somewhat less than \$350,600.—A railway tunnel under the Hudson river at New York is designed to give that city railway connection with the west. Work is at present (1881) slowly going on at the western end. It was for a time interrupted by a fatal accident, a considerable body of ground caving in.—Of the various mining tunnels in the United States the most notable is that at Sutro, Lyon co., Nev., about 10 m. s. of Virginia City. The tunnel, which opens the Comstock lode of silver, is about 4 m. long and has cost about \$5,000,000. See CENIS, MONT, *ante*, and GOTHARD, ST. *ante*.

TUNNY. *Thynnus vulgaris*, a fish of the family *scomberidae* (q.v.), found in the Mediterranean, and in the Atlantic ocean, but particularly abundant in the Mediterranean, where the tunny fishery is of great importance. It occasionally, but rarely, occurs on the British coasts. The genus *thynnus* is closely allied to *scomber* (see MACKEREL), but has the dorsal fins close together, the detached finlets more numerous. The tunny is a very large fish, sometimes 9 ft. in length, and weighing 1000 lbs., or even more. Its form is much thicker than that of the mackerel; its tail so widely forked as to be crescent-shaped. It is very plentiful near Constantinople, where it appears in shoals, sometimes so crowded that it may even be taken with the hand. The chief tunny fisheries of the present day, however, are on the coasts of Spain, Italy, and Sardinia. The Phenicians established a tunny fishery at a very early period on the coast of Spain, and the tunny appears on Phenician medals of Cadiz and Carteia. Salted tunny was much esteemed by the Romans, and was called *saltamentum sardicum*. The tunny is generally captured by means of nets arranged in a funnel-like form, the fish entering the wide mouth of the funnel, and being gradually driven to the narrow end, where they are killed by lances and harpoons. The line of nets is often more than a quarter of a m. long, and costs about \$6,000.—The AMERICAN TUNNY (*thynnus secundo-dorsalis*) is found on the coasts of New York, and thence northward to Nova Scotia. It sometimes attains a length of 12 feet. It is nearly black above, silvery on the sides, and white below. Its flesh is much esteemed. It also yields much oil, which is obtained by boiling the head and the belly. Twenty gallons of oil are often obtained from a single fish.

To the same genus with the tunny belong the bonito (q.v.) and the albacore or albacore (*T. albacorus*) which inhabits the West Indian seas, and is esteemed for the table. The name albacore, however, seems to be often given to different species of this family, inhabiting tropical seas, and sometimes to the tunny itself.

TUN'STALL, a prosperous market-t. of England, in the co. of Stafford. Pop. '71, 13,540.

TUNSTALL or **TONSTALL**, CUTHBERT, 1474-1559; b. England; educated at Oxford and Cambridge, and studied at Padua; was rector of Harrow-on-the-Hill, 1511; archdeacon of Chester, 1515; master of the rolls, 1516; sent as commissioner to Brussels; dean of Salisbury, 1521; bishop of London, 1522; lord privy seal, 1523; ambassador to Spain, 1525, and France, 1527; bishop of Dunham, 1530; deprived of his bishopric, 1532, and committed to the Tower on a charge of treason; reinstated by Mary, but declining the oath of supremacy to Elizabeth was again deprived, 1559. He published *In Laudem Matrimonie*; *Compendium and Synopsis*, an abridgement of Aristotle's *Ethics*.

TUOL'UMNE, a co. in central California; 2,300 sq.m.; pop. '80, 7,848—4,954 of American birth; 1236 colored. In this county is Table mountain, 30 m. long and 2,000 ft. high, with steep, perpendicular sides and composed of volcanic rock. Co. seat, Sonora.

TUPAIA. See BANXING.

TUPELO. *Nyssa*, a genus of trees of the natural order *alangiacæ*, natives of North America, chiefly of the southern parts of the United States; having simple alternate leaves

most entire, greenish, inconspicuous flowers at the extremity of long stalks, the fruit a drupe. *N. villosa* attains a height of 60 to 70 feet. It is often called BLACK GUM TREE. *N. tomentosa*, the LARGE TUPELO, is a lofty and beautiful tree, remarkable for the extraordinary enlargement of the base of the trunk, which is sometimes 8 or 9 ft. in diameter, while at no great height the diameter diminishes to 15 or 20 inches. The fruit resembles a small olive, and is preserved in the same way by the French settlers in America. *N. candicans* or *capitata*, the OGEECHEE LIME or SOUR GUM TREE, is a small tree, of which the fruit is very acid, and is used like that of the lime. The wood of all the species is soft, that of the large tupelo remarkably so.

TUPPER, BENJAMIN, 1738-92; b. Mass.; served in the French and Indian war, and in 1775 distinguished himself in a boat expedition in Boston harbor. He became col., had command of the squadron of North River gunboats, and took part in the battle of Monmouth. After the war he was active in suppressing Shay's insurrection and in 1787 settled at Marietta, Ohio.

TUPPER, MARTIN FARQUHAR, D.C.L., F.R.S., a poet rather popular than great, was b. on July 17, 1810. His father, Martin Tupper, was a well-known London surgeon, of a family originally German, which had long been settled in Guernsey. Martin Tupper was educated at the Charter-house, and afterward at Christ Church, Oxford. On leaving college, he entered himself as a student at Lincoln's inn, and was called to the bar in 1835; but literature had more charms for him than the law, which he never seriously prosecuted. In 1832 he published anonymously a small volume of poems, which attracted little attention. For this lack of success, he was, however, amply repaid on the appearance, in 1839, of his *Proverbial Philosophy*. The popularity of this work in England, and still more in America, has ever since been immense, and almost unprecedented. The critics have indeed been less kind to it than the reading public; and the fame of Mr. Tupper has long been a topic of mirth to the wits of the literary guild; but from the serene height of his fortieth edition an author can perhaps afford to smile at the attacks of the envious generation below. A fair criticism would probably adjudge that, while there is nothing in Mr. Tupper's *Proverbial Philosophy* to justify its enormous success—so far as mere circulation is success—the book is yet something better than the mere conglomeration of stupid platitudes, which its detractors so confidently proclaim it to be. Besides this work, on which his reputation—such as it may be—rests, Mr. Tupper has published *The Crock of Gold*, a tale; *Geraldine*, a sufficiently ludicrous attempt to complete Coleridge's inimitable fragment *Christabel*; with various other works in prose and verse, which it is quite unnecessary to enumerate, inasmuch as no one of them has succeeded in making the least impression on the public.

TURANIAN LANGUAGES. In opposition to *Iran*, the name of their own country, the Persians from the earliest times called the countries lying to the n. of it Turan, and this name is still frequently used as synonymous with Turkistan. The term Turanian derived from it has been adopted by philologists, in contrast with Aryan (q.v.), to designate a family of languages comprising "all languages spoken in Asia and Europe (including Oceania), and not included under the Aryan and Semitic families, with the exception of Chinese and its cognate dialects." The languages of this family are of the agglutinate order (see PHILOLOGY). Max Müller classes them in two great divisions, the northern and the southern. The northern division falls into five sections—the *Tungusic*, *Mongolic*, *Turkic*, *Finnic*, and *Samojedic*. Of these, the Tungusic dialects, which extend n. and w. from China, are the lowest in organization, being, some of them, nearly as destitute of grammatical forms as the Chinese. The Mongolic dialects are superior to the Tungusic, although the different parts of speech are hardly distinguished; both branches, however, are believed to be manifesting symptoms of grammatical development. The Turkic dialects, of which the Osmanli or Turkish of Constantinople is the most prominent, occupy an immense area, extending from the Lena and the Polar sea to the Adriatic. They are extremely rich in grammatical forms, especially in the conjugation of the verb. The most important members of the Finnic class are the Finnic of the Baltic coasts (see FINNS), and the Hungarian language, or Magyar (see HUNGARY). These dialects have also a fully developed grammatical structure, and in point of declension are even richer than the Turkic.

The southern division comprises, among others, the *Tamulic* or Dravidian dialects of southern India (see TAMIL); the *Gangetic* group, divided into two branches, the trans-Himalayan (Thibetan, q.v.) and sub-Himalayan (Bhotanese, etc.); the *Tuic*, or the dialects of Siam; and the *Malaic*, or Malay and Polynesian dialects. The Turanian languages do not present the same unmistakable family likeness, the same clear evidences of genealogical relationship, as are presented by the Aryan and Semitic groups. The nature of their structure, and the nomadic character of the peoples speaking them, are sufficient to account for their exceeding diversity, even supposing them to have all sprung from the same original stock. "The only characteristic Turanian feature which always remains is this: the root is never obscured. Besides this, the determining or modifying syllables are generally placed at the end, and the vowels do not become so absolutely fixed for each syllable as in Sanskrit and Hebrew. On the contrary, there is what is called the law of harmony, according to which the vowels of each word may be changed and modulated so as to harmonize with the key-note struck by its chief vowel. The

vowels in Turkish, for instance, are divided into two classes, *sharp* and *flat*. If a verb contains a sharp vowel in its radical portion, the vowels of the terminations are all sharp; while the same terminations, if following a root with a flat vowel, modulate their own vowels into the flat key. Thus we have *sev-mek*, to love, but *bak-mak*, to regard, *mek* or *mak* being the termination of the infinitive. Thus, we say, *so-ler*, the houses, but *at-lar* the horses, *ler* or *lar* being the termination of the plural."—Max Müller's *Science of Language*, 1st series.

TURBARY, in the law of England, is a right to go upon the soil of another and dig turf, and carry away the same. It is classed under the head of a *profit à prendre*, and is generally traced to some ancient custom of a manor, or is proved by prescription, or long use for 30 years and upward.

TURBINE. See WATER-POWER.

TURBINIDÆ, a family of gasteropodous mollusks, having a spiral shell with a narrow entire aperture. The species are numerous; some of them are found on the British coasts. They are numerous and widely distributed. Some are large, others small; some are very beautiful. The beautiful pheasant-shells (*phasianella*) of the South seas are referred to this family.

TURBOT, *Rhombus maximus*, a fish of the family *pleuronectidæ*, or flat-fishes, the most valuable of them all. The genus *rhombus* has the body rhomboidal; the dorsal fin commencing immediately above the upper lip, and extending almost to the tail-fin; the eyes generally on the left side. The brill (q.v.) belongs to it as well as the turbot, and some other less important fishes. The turbot attains a large size, sometimes 70 to 90 lbs. weight. Its form is shorter, broader, and deeper than that of almost any other flat-fish. It is of a brown color on the upper surface, which is studded with hard roundish tubercles. Like the other flat-fishes, it generally keeps close to the bottom of the sea; and it is found chiefly on banks where there is a considerable depth of water. Some of the banks in the German ocean abound in turbot—as the Dogger bank—and yield great quantities to the London market. The turbot, however, is also found, although more sparingly, in estuaries. In former times it was chiefly caught by long lines; but of late the greater part of the supply for the London market is obtained by beam-trawling (see **TRAWLING**). Few kinds of fish are more prized for the table than the turbot.—The **AMERICAN OR SPOTTED TURBOT** (*rhombus maculatus*) is also highly esteemed for the table. It is common on the coasts of New England and New York. It attains a weight of 20 lbs. The breadth is about one-half of the length. The upper surface is smooth, reddish-gray, with large circular or oblong darker blotches, and numerous white spots.

TURDIDÆ. See **MERULIDÆ**.

TURENNE, HENRI DE LA TOUR D'AUVERGNE, Vicomte de, one of the most eminent of France's military heroes, was the second son of Henri, duke of Bouillon, and Elizabeth of Nassau, the daughter of William I. of Nassau-Orange, the great assertor of the liberties of the Netherlands, and was born at Sedan, in the dep. of Ardennes, Sept. 11, 1611. Brought up in the Reformed faith, he was sent, on the death of his father in 1623, to Holland, where, under his uncle, the celebrated Maurice (q.v.), he was initiated into the art of war. Returning to France in 1630, he was favorably received by Richelieu, who at once gave him a commission. In 1637 he was attached to the army of Bernard of Weimar, which at that time was engaged in Lorraine; and by bringing about the capture of Landrecies, Maubeuge, and other places, including the key of western Germany, Brisach, gained such repute, that on his return to Paris (1638), he experienced quite a triumphal reception. The victories of Route and Casale in the Italian campaign of the following year, added to his laurels; and in 1641 he was for the first time intrusted with the supreme command. The rapid and thorough conquest of Roussillon from the Spaniards in 1642, was good proof of his masterly military genius, and was rewarded in 1643 with the baton of a marshal of France, and the chief command on the Rhine, where repeated reverses, a defective commissariat, and want of pay, had completely demoralized the army. But through a liberal expenditure of his own funds, and of loans obtained by him on his own security, the troops were speedily re-equipped; and by a victory over the Bavarians at Rottweil (1644), their morale was restored. Condé's arrival transferred him to a subordinate position; and his restoration to supreme command was followed by the commission of a glaring strategic error, for which he was severely punished by his able and watchful opponent, Mercy, who completely routed him at Marienthal, May 5, 1645; but on Aug. 3 of the same year, this disgrace was amply avenged by Condé at Nordlingen, where Mercy was slain; and Turenne gloriously concluded the war on the part of France by the reconquest of the Treves electorate, by the conquest of Bavaria in conjunction with the Swedes, and by a successful campaign in Flanders. In the civil wars of the Fronde (q.v.), which immediately followed, Turenne joined the party of the *frondeurs*, of whom his elder brother was one of the principal leaders; but after being defeated at Rethel (Dec. 15, 1650), he withdrew to Flanders, returning on Mazarin's retirement. On the minister's return, Turenne joined his party, while Condé deserted to the *frondeurs*, and the two greatest generals of the period were for the first time pitted against each other. Turenne was

uniformly victorious over his former chief, though his forces were inferior in number; and ultimately forced him to retire from France; after which he subdued the revolted cities, crossed the northern frontier, and conquered much of the Spanish Netherlands. In 1667, on the outbreak of war between France and Holland, Louis XIV. created Turenne mar. gen. of France, and would have made him constable, had he not been a Protestant. Indeed, the unorthodoxy of Turenne had for some time been a matter of grave concern to the bigoted young monarch, at whose suggestion Bossuet attempted the veteran's conversion by composing his celebrated *Exposition de la Doctrine Chrétienne*, which, backed by the king's repeated solicitations and remonstrances, and doubtless, as Voltaire suggests, by the more efficacious promptings of ambition, had ultimately the desired effect. Turenne's campaign in Holland, in which he was nominally under Louis's command, was a most triumphant one; and the elector of Bradenburg, who had ventured to side with the Dutch, was pursued to Berlin (1672), and forced to beg for peace. The emperor next took up arms on behalf of Holland, whereupon Turenne was transferred to the Upper Rhine. This, his last campaign, is foully disfigured by the horrible devastation of the Palatinate, executed under express orders, doubtless, but with a willing thoroughness which is utterly unjustifiable. After routing the Germans at Mulhausen and Turckheim, and forcing them across the Rhine, he was at last opposed to a worthy antagonist in Montecuculi (q.v.); but, unfortunately, their famous passage of strategy of nearly half a year's duration was left unfinished. Turenne being killed while reconnoitering the ground at Salzbach, with a view to a grand engagement. His grateful sovereign, to show that he made no distinction *entre porter le sceptre, et le bien soutenir*, ordered him to be entombed at Saint Denis, and funeral orations were pronounced for him by Flechier and Mascaron. On the desecration of Saint Denis during the revolution, Turenne's monument suffered with the rest, and was ultimately placed by Napoleon under the dome of the Invalides. Turenne has left memoirs of his campaigns from 1643 to 1658, which are of considerable interest to the student of history. Many biographies of this eminent warrior have been written, by Raguenet, Ramsay, Buisson, D'Avrigny, etc.

TURF. See HORSE RACING.

TURF LAWS. The laws concerning the ancient pastime of horse-racing are subdivided into those affecting races, wagers, and betting-houses, for which last, see BETTING. 1. As to racing, it has sometimes been popularly believed that the public have a right to trespass on lands to attend or to hold races; but no such right exists. Hence the stewards or persons intrusted with the management and possession of the land for the time have a right, which is seldom enforced, to turn off any person they please from the grounds. A sweepstakes is a stake or fund, for which at least three entrances must be made, and the whole stake becomes, under certain regulations, the property of the winner. Many of the great races are not run within a year from the time the horses are entered. The owner of a horse entered can withdraw or "scratch" him before the race is run. When the race is run, the successful party may sue for the amount of the stakes; and if the race is not run, or cannot be run, each subscriber may sue for recovery of his contribution; but no one can obtain his contribution, or countermand it, till the event has happened, for a sweepstakes is a legal contract to abide the result. If the stakes are contributed for an illegal game, it is otherwise; and before the stakes have been paid away, any contributor may sue for and recover his deposit; but he ought also formally to demand it back. The stewards are the proper parties to decide all disputes about the fairness of a race, and their award is binding: if they cannot agree, then it will fall to be decided by a jury. It is no legal objection to their award, that one of them is interested in the decision, for this is considered partly unavoidable, and within the knowledge of all parties as a probable event. If there are three stewards, the decision of the majority is binding.—2. As to wagers. It was not illegal at common law to enter into a wager, if the subject-matter was not injurious to morality or decency; and hence the bet could be recovered by action, and betting on a race is still legal to any extent. But by the act 8 and 9 Vict. c. 109, s. 15, all wagers were declared void, except as regards subscriptions of money or plate to be awarded to the winner of a lawful game, sport, pastime, or exercise. If one makes a wager on a race, he may retract it at any time before the event comes off, and require the money, if deposited, to be repaid; and no wager can be tried in any court of law or equity, so that the winner cannot compel payment. It is merely a debt of honor.

TURGENEFF, ALEXEI, 1785-1845; b. Russia, traveled extensively in Germany, Italy, France, and Denmark, making investigations in regard to the mediæval history of Russia. He published *Historiæ Russiæ Monumenta*, 2 vols. (1841-42); and *Supplementum* (1848).

TURGENEFF, IVAN SERGYLLVICH, b. Orel, 1818; educated at Moscow, St. Petersburg, and the university of Berlin. After his return to Russia he obtained a situation in the office of the minister of the interior. In 1847, however, he was banished owing to a study he published on *Nicholas Gogol*, but was allowed to return three years later. He has since chiefly resided in Paris and Baden. Most of his novels have been translated into French, and the following have appeared in English: *Russian Life in the Interior*, or *the Experiences of a Sportsman* (1855); *Fathers and Sons* (1867); *Smoke*, or

Life at Baden (1868); *Liza* (1869); *On the Eve* (1871); *Dimitri Roudine* (1873); *Spring Floods* (1874); and *Virgin Soil* (1877).

TURGENEFF, NIKOLAI. 1790–1871, b. Russia; educated at Göttingen. He entered the Russian civil service, and in 1813 was associated with baron Stein in governing the German provinces taken from France. He was afterward deputy secretary of the interior and agriculture. He advocated the emancipation of the serfs, and in 1825 was sentenced to death for his connection with the attempt at revolution in 1825. He escaped to Paris, where he published *La Russie et les Russes*.

TURGOT, ANNE ROBERT JACQUES, French statesman, b. in Paris, May 10, 1727, was descended from one of the oldest families in Normandy. Turgot was destined for an ecclesiastical career, but adopted by preference the profession of law. In 1761 he was appointed intendant of Limoges, and administered the affairs of the province for thirteen years. He introduced a more equitable administration of imposts, and succeeded in abolishing the old method of repairing roads and bridges by the compulsory labor of the poor inhabitants of the district, called *corvées*. He also exerted himself in providing for the subsistence of the people and the protection of commerce. He introduced into the Limoges the cultivation of potatoes. A wider field opened before him on the death of Louis XV. The finances were in a terrible state of disorder, the whole social and political system of France needed regeneration and reform; and Turgot appeared to be the man to meet the crisis. He was first made minister of marine, and afterward comptroller-general of France, when to fill that post was to be virtually the prime minister. In his letter to Louis XVI., he adopted, as the principle of his administration, that there should be "no bankruptcy, no augmentation of imposts, no loans;" yet he foresaw that the strength of the privileged classes; and the corrupt influence of those who profited by abuses, would be too much for him, and that against such enemies he could hardly hope to retain the confidence of the king. His first task was so far to reduce the expenditure as to leave a surplus of 20 millions of francs a year, to be applied to the liquidation of old debts. He augmented the public revenue without imposing new taxes, and he introduced exactness of payments and fidelity of engagements into all his financial operations. One of his first measures was the carrying out of free-trade in corn throughout the interior of the kingdom. He constantly occupied himself with the amelioration of the condition of the people. He proposed to enfranchise the rural districts from statute labor, provinces from their barriers, commerce from internal duties, trade from its shackles, and lastly, to make the nobility and clergy contribute to the taxes in the same proportion as the third estate. This great minister and virtuous citizen, of whom his colleague, Malesherbes, said: "He has the head of Bacon, and the heart of L'Hopital," wished, by means of provincial assemblies, to accustom the nation to public life, and prepare it for the restoration of the states-general. If the nobility and privileged classes had possessed enough of foresight and patriotism to submit to his plans for reforming France, she might have been spared the horrors and excesses of the revolution. But his projects for the public good were defeated by the confederacy formed against him by nobles, courtiers, farmers of the revenue, and financiers. The king forsook him, although, at the same time, observing that Turgot and himself were the only persons who desired the welfare of the people. He retired, having held office for only twenty months. It is alleged against his practical talent for statesmanship, that he labored under a want of address, and that he did not sufficiently dissemble his hatred and contempt for the cowardice and baseness of those who fattened upon the abuses that were eating like an ulcer into the heart of France. After his retirement, he resumed his early worship of the muses. His Latin inscription for the portrait of Franklin is a line of which any author might be proud: "*Eripuit cælo fulmen, sceptrumque tyrannis.*" He also devoted himself to physics and mathematics. His works are a mine of sound and original thought. His *Mémoire* on the American war expresses views on the nature of colonies which have since been adopted by the best writers. His work on *Usury* contains almost all that is of value in Bentham's *Letters on the Usury Laws*. He held general objections to charitable institutions. He died of gout, Mar. 20, 1781, leaving behind him a memory which France will ever cherish with veneration.

TURIN (*Augusta Taurinorum, Bodincomagus, Colonia Julia, Taurasia*—in Italian, *Torino*), a city of northern Italy, formerly capital of Piedmont, then of the kingdom of Italy, is situated near the confluence of the Po and the Dora Ripaira. 45° 5' n. lat., 7° 42' e. long. Its pop. at the beginning of this century was 42,000—in 1863, it was 235,000; now that it is no longer the capital, it is reduced to (1872) 207,770. It began to acquire importance when Amadeus V. declared it the capital of Savoy in 1418; built a castle there, and made it his residence. In 1620 Charles Emmanuel I. enlarged the city by royal decree: it was still more enlarged in 1673 and in 1702. At the beginning of this century the French destroyed and leveled the ramparts of the town, converting them into public promenades. Of late years the moats and fortifications have been demolished to make way for new streets toward Pota-Susa. In consequence of these improvements Turin has become one of the handsomest cities in Europe. It is famed for its handsome squares. Some of the finest are—piazza San Carlo, surrounded by wide porticoes, and adorned by a fine equestrian statue of Emanuel Philibert of Savoy, by Maro-

chetti; piazza Castello, also surrounded by porticoes, which are prolonged down via Po to the end of piazza Vittorio Emanuele, the finest square in Europe for size, regularity of architecture, and beauty of situation; piazza Carlo Felice, with porticoes and a fine garden; piazza Carlo Alberto, with an equestrian statue of the king of that name by Marochetti; piazza d'Armi, a vast open space for military exercises, flanked by the old and new arsenals of the kingdom. Leading out of piazza Vittorio Emanuele, there is a handsome five-arched bridge across the Po, begun by Napoleon I., with money got by the sale of the jewels and votive offerings of the cathedral, and finished by the kings of Sardinia. Another fine bridge is that across the Dora, of one single arch, nearly straight, the work of the engineer Mosca. Among the numerous churches, the principal are the cathedral of San Giovanni, a Gothic structure built in the 7th c., and reconstructed in 1498; San Filippo, the handsomest church in Turin; La Consolata; La Gran Madre di Dio; and a Waldensian temple. On the summit of a hill near the town is La Superga, a splendid basilica, raised by Victor Amadeus to fulfill a vow, and now the mausoleum of the house of Savoy. Among the "palaces" must be noticed the royal palace designed by Castellamonte, which is poor in outward appearance; the Carignano palace, an odd building, by Guarini; the town-hall, designed by Lanfranchi; the university, with 71 professorships and about 900 students, a library of 120,000 vols., and 2,000 MSS.; the Accademia delle Scienze, with an Egyptian museum, the finest in Europe; the seminary; the hospital of San Giovanni. The private palaces are numerous and vast, but in a bad style of architecture. There is the theater royal; the Carignano theater, designed by Alfieri; the Vittorio Emanuele, and many other theaters.

The manufactures of Turin consist of woolen and silk fabrics, velvet hats, paper, pottery, leather, arms, and liquors. The population is sober, industrious, and generally well off.

Turin was originally inhabited by the Taurinians, a tribe of Ligurians. It is first mentioned in history in the time of Hannibal, by whom it was taken and sacked, on his descent into Italy after crossing the Alps. Turin became a royal colony 166 B.C., and was called by Augustus, *Augusta Taurinorum*. On the fall of the empire it went to the Lombards, and became the capital of one of the 30 Lombard duchies. Charlemagne made it the residence of the duke of Susa, whose line ruled till 1032, when the house of Savoy succeeded it. It was taken by the French in 1506, and held by them for nearly 60 years. They again took it in 1640; and in 1796 it was dismantled, and united to the French empire in 1800 with the name of the department of the Po. In 1815 it was restored to the house of Savoy.

TURKESTAN, or TOORKISTAN. See TURKISTAN, *ante*.

TURKEY *Meleagris*, a genus of gallinaceous birds of the family *paronidae*, or, according to some ornithologists, of a distinct family, *meleagridæ*, both, however, being included by others in *phasianidae*. The head is bare, the neck wattled, and the bill of the male surmounted with a conical fleshy caruncle, sometimes erected, sometimes elongated and pendulous. A curious tuft of long hair springs from the base of the neck of the male, and hangs down on the breast. The bill is rather short, strong, and curved, the tail is broad and rounded, capable of being erected and spread out, as the male delights to do when he struts about in pride, with wings rubbing on the ground, uttering his loud peculiar *gobble*. The COMMON TURKEY (*M. gallopavo*), the largest of gallinaceous birds, well-known as an inmate of our poultry-yards, is a native of North America. It appears to have been introduced into Europe in the beginning of the 16th c., and is naturalized in some places, as it may be said to have been in the royal park of Richmond, near London, in the first half of the 18th c., when that park contained about two thousand turkeys; but in consequence of the frequent fights between poachers and keepers, it was thought proper to destroy them. Fewer attempts have been made than might have been expected to introduce the turkey in parks and woods in Britain, where it might probably be expected to succeed as well as the pheasant. In a domesticated state the turkey varies much in plumage; in its wild state this is not the case. The plumage of the wild turkey is also richer, and its power of wing greater; but the wings even of the wild bird are short, scarcely extending beyond the base of the tail. The darkest-colored of domesticated turkeys most nearly resemble the wild turkey in plumage. In its native woods it seems to attain even a larger size than in the poultry-yard. Turkeys were once plentiful in the forests of the Atlantic states of North America, and as far n. as lower Canada, but have disappeared as cultivation has advanced, and have become rarer even in the eastern parts of the valley of the Mississippi, where their numbers were once very great. The turkey is found as far s. as the isthmus of Darien, but does not occur to the w. of the Rocky mountains. It inhabits the woods of the larger islands of the West Indies. In warm climates it is said to produce two or three broods a year; but in colder countries it produces only one. The males associate in flocks of from 10 to 100, and seek their food during great part of the year apart from the females, which go about singly with their young, or associate in flocks, avoiding the old males, which are apt to attack and destroy the young. At the pairing-time desperate combats take place among the males. Wild turkeys roost on trees. They feed on all kinds of grain, seeds, fruits, grass, insects, and even on young frogs and lizards. They make their nests on the ground, merely gathering together a few dry leaves, and often

in a thicket. The eggs are usually from 9 to 15 in number, sometimes 20. They spread themselves in summer over the higher grounds; but in winter congregate in the rich low valleys. The sexes mingle in winter and form larger flocks than in summer.

On account of its size, and the excellence of its flesh and eggs, the turkey is one of the most valued kinds of poultry. The management of it differs little from that of the common fowl. The young are tender for the first few weeks, and require care, particularly to keep them from getting wet by running among the wet grass, or the like; but afterward they are sufficiently hardy. Nettles are excellent food for turkeys, and are often chopped up for them, to be given in addition to grain, bran, boiled potatoes, and other such food.

The only other known species of turkey is *meleagris ocellata*, a native of the warmest parts of North America. It is not quite so large as the common turkey, and has a smaller tail. The neck is less wattled, but the head has a number of fleshy tubercles. The plumage is beautiful, rivaling that of the peacock in metallic brilliancy: blue, green, bronze, red, and golden hues being intimately and finely mingled, and forming *eyes* on the tail; whence the specific name.

TURKEY, or the **OTTOMAN EMPIRE** (q.v.), includes large portions of the continents of Europe, Asia, and Africa, and consists of Turkey proper, which is under the direct rule of the sultan, and of several dependent and tributary states. The arrangements sanctioned by the Berlin congress in 1878 have largely changed the size and organization of the empire. It will be some time before Turkish affairs settle again into equilibrium, and reliable statistical results of the formally sanctioned reorganization cannot immediately be expected. In any case, it is necessary for an understanding of Turkey as it now is, to begin with Turkey as it was before the last momentous war with Russia.

The *Almanach de Gotha* of 1878 gave the following estimate of the area and population of the Turkish empire before the sweeping changes agreed to at Berlin:

	Sq. Miles.	Population.
I. Immediate possessions—		
In Europe.....	139,824	9,400,364
In Asia and Africa.....	1,083,673	18,079,112
District of Constantinople.....		1,400,000
Nomadic races.....		2,000,000
Army and police.....		500,262
Foreign residents in Turkey.....		500,000
	1,223,497	31,939,738
II. Protectorates—		
In Europe } Roumania.....	46,617	5,073,000
} Servia.....	14,549	1,367,000
In Africa } Egypt.....	866,012	17,000,000
} Tunis.....	45,528	2,000,000
III. Tributary principality of Samos.....	212	35,878
	972,928	25,475,878
Turkish empire.....	2,196,425	57,415,616

Montenegro, formerly a tributary state, had been virtually independent for many years.

The population of the various provinces, even of European Turkey, has always been difficult to ascertain. The most satisfactory estimate was probably one made before the vilayet of Herzegovina was separated from Bosnia, and published in 1876 in the Vienna journal *Monatsschrift für den Orient*. This was based on the *Salnamés*, or official almanacs of the vilayets, and shows at the same time the distribution of the religious provinces, but it takes account only of the male population.

	Moslems.	Non-Moslems.
Vilayet of Bosnia.....	309,522	306,707
" Monastir.....	485,993	417,805
" Janina.....	250,749	467,601
" Salonica.....	124,828	124,157
" Adrianople.....	235,587	401,148
" Danube.....	455,767	715,938
	1,862,446	2,433,336

Constantinople, not included in any of the six vilayets, had a total population of 680,000. The total male population of European Turkey, excluding the vassal provinces, was 4,976,000. The entire population of both sexes might, therefore, be assumed to exceed 10,000,000. The proportion of non-Moslems to Moslems given above (57 to 43) probably understates the numerical predominance of the former.

Many of these estimates have of course become obsolete since the Berlin congress of 1878 (see History of the OTTOMAN EMPIRE). This congress, which met primarily to

revise the "preliminary" treaty of San Stefano, concluded between Russia and Turkey at the close of the war of 1877-78, has revolutionized the relation of the porte to the subject Christian principalities and provinces, alienated large portions of hitherto Turkish territory, and inaugurated what must necessarily be a new era in the history of the Ottoman empire. The principal results of the congress's work are treated under the several heads of the states they chiefly concern (see ROMANIA, SERBIA, MONTENEGRO, BULGARIA, etc.), but must here be briefly summarized.

The vassal states Rumania and Servia, as well as Montenegro, were declared independent, and each obtained a change or extension of territory; Rumania, which had to yield up its portion of Bessarabia to Russia, received in compensation the Dobrudscha, cut off by a line from Silistria to Mangalia. Servia was considerably extended to the south. Montenegro received an additional strip of territory round almost the whole of its former frontier, including part of the Adriatic sea-board of Antivari. What was formerly the Turkish vilayet of the Danube, was, with the exception of the Dobrudscha, now Rumanian, constituted a tributary but automatic principality, its southern boundary being the Balkan range. A large territory to the s. of the Balkans was constituted into the separate province of Eastern Roumelia, and though remaining directly under the military and political authority of the sultan, secured the right of having a Christian governor-general and administrative autonomy. It was agreed that Herzegovina and Bosnia, excepting a small portion of the latter, should be occupied and administered by Austro-Hungary, and thus in large measure alienated from the porte; Spizza and its sea-board, immediately n. of Antivari, was incorporated with Dalmatia; Greece was to receive additional territory; the congress recommending that the rectified frontier should run up the Salambria river from its mouth, cross the ridge dividing ancient Thessaly from Epirus, cut off the town of Janina so as to leave it to Greece, and descend the Kalamas river to the Ionian sea. In Crete the reformed government promised in 1868 is to be immediately and scrupulously carried out. In Asia the changes were much less considerable; the port of Batum, henceforth to be essentially commercial, Kars and Ardahan, with a portion of Armenia, were ceded to Russia, and Khotour, e. of lake Van, to Persia; the porte engaging to carry out at once much needed administrative reforms in Armenia, and to see to it that henceforth religious difference shall in no part of the Ottoman empire hinder any one from the full exercise of all civil and political rights, or exclude from public offices or the professions.

Another engagement, entered into by Turkey at the same time, seriously affects the standing of the empire, though it introduces no territorial change. By the "conditional convention" made between Turkey and the United Kingdom, the English government undertakes to defend the porte's dominions in Asia, and receives in return the right to occupy and administer the island of Cyprus.

A table of the area and population of Turkey in Europe (Turkey in Asia and Africa remaining substantially unaltered) would have to be thus arranged:

	Sq. Miles.	Population.
I. Immediate possessions, including Constantinople, the vilayets of Monastir, Salonica, the isles, and Crete, and part of Janina and Adrianople.. Army, etc.....	64,000	5,350,000 300,000
II. Autonomous province of Eastern Roumelia.....	15,000	1,000,000
III. Provinces of Bosnia and Herzegovina, administered by Austria.....	23,000	1,350,000
IV. Tributary principality of Bulgaria.....	33,000	2,000,000
Total of Turkey in Europe.....	135,000	10,000,000

TURKEY IN EUROPE, generally hilly and undulating, is traversed by a mountain system which has its origin in the Alps, enters Turkey at the n.w. corner, and runs nearly parallel to the coast, under the names of the Dinaric Alps and Mt. Pindus, as far as the Greek frontier. This range sends numerous offshoots e. and w.; the great eastern offshoot being the Balkans (q.v.) range, with its numerous branches to n. and south. The rivers of Turkey are chiefly the tributaries of the Danube; the Maritza, Strumo, Vardar; the Narenta, Drin, and Voyutza.

On the high lands, the cold is excessive in winter, owing to the n.e. winds, which blow from the bleak and icy steppes of southern Russia; and the heat of summer is almost insupportable in the western valleys. Violent climatic change is, on the whole, the rule, in European Turkey; but those districts which are sheltered from the cold winds, as the Albanian valleys, enjoy a comparatively equable temperature. The soil is for the most part very fertile; but owing to the positive discouragement of industry by the oppressive system of taxation which was long in force, little progress has been made in the art of agriculture, and the most primitive implements are in common use. The cultivated products include most of those usual in central and southern Europe—viz., maize, rice, cotton, rye, barley, and millet. The mineral products are, iron in abundance, argentiferous lead ore, copper, sulphur, salt, and alum, and a little gold, but no coal. The wild animals are the wild boar, bear, wolf, wild dog, civet, chamois, wild ox, and those others which are generally distributed in Europe. The lion was formerly an inhabitant of the Thessalian mountains.

TURKEY IN ASIA.—This portion of the Turkish empire is more hilly than the other, the two almost parallel ranges, Taurus and anti-Taurus, which are the basis of its mountain-system, cover almost the whole of the peninsula of Asia Minor or Anatolia (q.v.), with their ramifications and offshoots, forming the surface into elevated plateaux, deep valleys, and inclosed plains. From the Taurus chain, the Lebanon range proceeds southward parallel to the coast of Syria, and diminishing in elevation in Palestine, terminates on the Red sea coast at Sinai. Besides the Euphrates (q.v.), Tigris (q.v.), and Orontes (q.v.), the only important rivers of Turkey in Asia are the Kizil-Ermak, which rises on the borders of Cilicia, and after a devious course across the peninsula, falls into the Black sea, near Samsoun; the Mæander and Sarabat, which flow to the Ægean; and the Sakaria, which empties itself into the Euxine. On the whole, Turkey in Asia is ill-supplied with water; and though the mountain slopes afford abundance of excellent pasture, the plains, and many of the valleys, especially those of the Euphrates, Tigris, and Jordan, are reduced by the parching draughts of summer to the condition of sandy deserts. In ancient times, these now desert districts were preserved in a state of fertility by artificial irrigation; but during the six centuries of almost constant war which convulsed this once fair region, the canals were neglected, and have, ever since the rise of the Osmanli power, remained in an unserviceable condition. Nevertheless, the fertile portions produce abundance of wheat, barley, rice, maize, tobacco, hemp, flax, and cotton; the cedar, cypress, and evergreen oak flourish on the mountain slopes; the sycamore and mulberry on the lower hills; and the olive, fig, citron, orange, pomegranate, and vine on the low lands. The mineral products are iron, copper, lead, alum, silver, rock-salt, coal (in Syria), and limestone. The fauna includes the lion (e. of the Euphrates), the hyena, lynx, panther, leopard, buffalo, wild boar, wild ass, bear, jackal, jerboa, and many others; and the camel and dromedary increase the ordinary list of domestic animals.

Industry, Manufactures, and Trade.—Notwithstanding the primitive state of agriculture in Turkey, the extreme fertility of the soil, which returns from 25 to 100 fold, makes ample amends for this defect, and supplies materials for the comparatively unimportant manufactures and industries of the country. The products are wax, raisins, dried figs, olive oil, silks, red cloth, dressed goat-skins, excellent morocco, saddlery, swords of superior quality, shawls, carpets, dye-stuffs, embroidery, essential oils, attar of roses, opium, corn, plum brandy, etc. The exports include also wool, goats' hair, meerschaum clay, honey, sponges, drugs, madder, gall-nuts, various gums and resins, and excellent wines; the imports are manufactured goods of all kinds, glass, pottery, arms, paper, cutlery, steel, amber, etc. Previous to the recent Russian war, the average annual value of the imports of Turkey in Europe was estimated at £18,500,000, and the exports at £10,000,000. Trade has dwindled to about one-third of its former dimensions, since the war. The exports from the whole of the Turkish empire to Great Britain amounted, in 1877, to £6,851,108; and the imports thence to £5,624,910. The countries which trade with Turkey are, in order of importance, Persia, Great Britain, France, Austria, Russia, Egypt, etc.; and the principal ports of the empire are Constantinople, Trebizond, and Smyrna. The mercantile marine of Turkey is small. In 1877 it comprised only some 230 sea-going ships (a dozen of them steamers), of a total tonnage of 34,800 tons. In 1878 there were over 780 m. of railway open for traffic in European Turkey; in the Asiatic part of the empire about 175 miles.

Population.—A more heterogeneous aggregation of races than that which constitutes the population of the Turkish empire can hardly be conceived. Turks, Greeks, Slavs, Romanians, Albanians, are largely represented, besides Armenians, Jews, Circassians, etc., and Frank residents. In European Turkey, the Turks are estimated at 2,200,000; the Slavs, including the Bulgarians of the principality, at near 2,000,000; the Greeks at 1,030,000; the Albanians at 1,250,000; and the Romanians at 1,000,000. Then in Asia there may be 4,450,000 Turks, not to speak of those in Africa; of Turkomans, 100,000; of Kurds, 1,000,000; of Syrians, 190,000—all in Asia; 1,000,000 Greeks; 2,400,000 Armenians (partly in Europe); as well as Jews, Arabs (in Asia and Africa), Druses, Franks or western Christians, gypsies, Tartars, Circassians and other kindred races, Copts, Nubians, Berbers, etc. Of these, the Greeks and Armenians are traders; the Slavic people and the Albanians are the chief agriculturists in Europe, and the Osmanlis, Armenians, Syrians, and Druses in Asia. Of the whole population about 25,000,000 are Mohammedans, and 15,300,000 Greek and Armenian Christians.

Administration, Religion, Education.—The government of Turkey has always been a pure despotism; the constitution granted in 1876 and revoked in 1878 was only nominal. The power of the sultan (also called padishah, grand seignior, khan, and hunkiar) is much limited by the *sheikh-ul-islam*, the chief of the *Ulemas* (q.v.), who has the power of objecting to any of the sultan's decrees, and frequently possesses more authority over the people than his sovereign. The supreme head of the administration, and the next in rank to the sultan, is the grand vizier (*sadr-i-azam*), under whom are the members of the cabinet or divan (*menasib-i-divaniye*), namely, the presidents of the supreme council of state (*alkiami-adliye*) and of the tanzimat (q.v.), the *seraskier* (q.v.), the *capudan pasha*, or high admiral, and the other heads of departments of the administration. The governors of the *eyalets*, or provinces, are styled *valis*; each *eyalet* is divided into *sanjaks*, or *livas*, ruled by *kaimakams*; each *liva* containing a number of

cazas, or districts; and each *caza* a number of *nahiyehs*, composed of villages and hamlets. The provincial governors have no longer the power of life and death; and the introduction of the system of tax collection in practice in western Europe, has greatly diminished their power of practicing extortion on those under their rule. The variable imposts are, however, farmed, but considerable restrictions are imposed on the farmers to prevent oppression. The established religion is Mohammedanism, but all other sects are recognized and tolerated; and since 1856, a Musselman has been free to change his religion at pleasure, without becoming liable to capital punishment, as was formerly the case. Education was long neglected, but in 1847 a new system was introduced; and since then, schools for elementary instruction have been established throughout Turkey; and middle schools for higher education, and colleges for the teaching of medicine, agriculture, naval and military science, etc. Many wealthy Turks, however, send their sons to France or Britain to be educated. The newspapers published in Turkey are not all printed in Turkish: several of them are printed in Greek, French, and other languages.

Revenue and Debt.—The Turkish government has never published an account of the actual revenue and expenditure of the empire. Estimates were given: but the budgets were so constructed as either to show a surplus, or to make the income and disbursements balance one another, while it was notorious that there were heavy deficits year by year. Years before the war 1877, the Turkish exchequer was evidently on the brink of insolvency, as was manifested by the violent expedients proposed for escaping from part of its liabilities. In 1875 a decree reduced the interest payable on the debt to one-half the proper amount; and another decree in 1876 announced that no further payments would be made till the internal affairs of the empire should allow of it. The enormous expenditure of the war, and the loss of valuable provinces, have only added to the utter disorganization of Turkish finances.

The first budget that admitted a deficit was that of 1874–75, where the revenue was given at £22,552,300, and the expenditure at £22,849,610. In 1875–76 the revenue was estimated at £19,106,352, and the expenditure at £23,143,276. In 1878–79, it has been (unofficially) calculated that the revenue cannot exceed £14,000,000, while, with a proportion of the war expenses to clear off, the outlay must amount to some £50,000,000.

Between 1854 and 1874, when the borrowing power of Turkey came to an end; fourteen several loans had been contracted to meet deficiencies. At the end of that period, the foreign debt of Turkey amounted to £184,981,783. The internal and floating debt of the empire is difficult to ascertain; it has been stated in 1878 at £75,000,000. Meanwhile further to stave off the evil day, the government has issued vast quantities of *caimés* or paper money, probably to the nominal value of £90,000,000.

Navy and Army.—The navy of Turkey consisted at the end of 1878 of 15 large armor-clad vessels, 18 smaller iron-clads (including 11 monitors and Danube gun-boats), and 45 other steamers. The two largest iron-clads have a tonnage of 9,140 tons, and armor 12 in. in thickness at the water-line.

The army is composed of the active or regular army (*nizam*), of the reserve (*redif*), and of irregular troops; the *nizam* contains 44 regiments of infantry; 27 regiments of cavalry; 7 regiments of field-artillery; and a brigade of engineers. The irregular troops comprise 16 regiments of gendarmes, the now notorious Bashi-Bazouks (volunteer infantry receiving from the government only arms and ammunition), and volunteer cavalry. The law of 1869 contemplated an active army of 220,000 men, with 80,000 in the first reserve, 420,000 men in the second reserve, and the *hiyade* or landsturm. Military service of 20 years (of which 4 are spent in the active army) is obligatory on all Moslems. The auxiliaries are 75,000, and the irregular troops 87,000.

The history of Turkey is given under OTTOMAN EMPIRE.

TURKEY BUZZARD. See VULTURE.

TURKEY-RED. This celebrated color—the most durable, and perhaps one of the most beautiful which has yet been produced on cotton—is dyed by a process supposed to have been practiced in India from immemorial time. It passed from thence through other parts of Asia to the countries of the Levant, and was introduced into France about the middle of last century. The first successful attempt to introduce it into Great Britain was made in Glasgow in 1783, by a Rouen dyer named Papillon, in conjunction with Mr. George Macintosh, the father of the inventor of waterproof cloth. They established the celebrated Turkey-red business now carried on by Messrs. Henry Monteith & Co. By an agreement with the trustees for manufactures in Scotland, Papillon allowed them to make his process public in 1803; and since then, Turkey-red dyeing has been extensively carried on in Glasgow and its neighborhood, and also in Lancashire.

There is a mode of dyeing cotton red with madder practiced by calico-printers—the cloth being previously bleached with chloride of lime—where the whole process only occupies a day or two. But in the case of Turkey-red, which is also a madder-dye, the operations are long and tedious, and the bleaching with chloride of lime especially objectionable. The following is an outline of the steps in the Turkey-red process, as usually conducted: 1. Unbleached calico is thoroughly washed at a dash-wheel or other washing-machine, and then boiled for some time in a solution of carbonate of soda. 2.

The cloth is soaked in a bath containing a soapy emulsion of olive oil, sheep's dung, carbonate of soda, and water; and allowed to remain for a week or more impregnated with the solution, after which it is aired in the field, and dried in stoves. This operation is repeated at least three times. 3. The next stage, sometimes called "liquoring," consists in passing the cloth through an emulsion of olive oil and carbonate of soda, but without sheep's dung; after which it is aired in the field, and dried in stoves, as in the last operation. The "liquoring" is repeated at least four times. 4. The cloth now requires to be soaked in a weak alkaline lye of pearl-ash and soda, in order to remove any excess of oil. 5. The cloth is warmed in a bath containing a mixture of powdered oak-galls and sumac, or either of these substances alone, the operation being sometimes called "galling," and sometimes "sumaching." 6. The cloth is next steeped for twelve hours in a solution of alum, partially neutralized by carbonate of soda, but sometimes acetate of alumina is used instead of alum. Without this treatment, the dye could not be fixed upon the cotton. See DYEING. 7. When thoroughly washed, the cloth is ready to receive the red dye, which is produced by immersing it in a decoction of madder, to which some chalk and bullock's blood are sometimes added. It is put into the dye-beck when cold, and kept in it for two hours after it has been raised to the boiling-point. 8. It is next boiled in a weak solution of soap and soda, which removes a brown coloring matter present in the madder-dye, but more fugitive than the red portion. 9. Finally, the dyed cloth is cleared or brightened by boiling it in a solution of chloride of tin, and then washing and drying it. A more recent plan is to employ chloride of lime for the clearing.

The theory of Turkey-red dyeing is not well understood, which so far accounts for the fact that it has been found impossible materially to shorten the process. The three most essential operations are the oiling, or rather the impregnation with an oleaginous soap, the mordanting with alumina, and the dyeing with madder; but it is found that if any of the numerous dippings in the oily emulsions are left out, the color is inferior in proportion to the number of omissions. This is the least understood part of the process, and is no doubt the cause of the rich appearance of the dye, which approaches some of the fine reds produced on wool.

Besides being largely used in its plain state, Turkey-red cloth is extensively employed for handkerchiefs with white patterns produced upon them by discharging the color (see BANDANA); and of late years articles of various kinds, with patterns in several colors, have been produced by ordinary calico-printing machines, where, by proper arrangements, the different colors are obtained on parts where the red color is discharged by chloride of lime.

TURKEY-STONE. See HONES.

TURKISH LANGUAGE AND LITERATURE. The Turkish is one of the Turanian (q.v.) idioms, and is chiefly divided into eastern and western Turkish. The former is mainly represented by the Uigur (Jagatai), an idiom but recently recognized not only to belong to the Turkic stock, but to be its most ancient representative. Its forms are fuller and more pure, albeit, to a certain extent, harder and rougher. Its alphabet is formed from the Zabian, out of which have sprung also the Mongol and Mantshu. Besides this, the Kiptchak, spoken in Kasan and Astrakhan, forms a principal branch of the eastern Turkish, for which, however, but little has hitherto been done from a philological point of view.

Of infinitely higher importance, however, is the western Turkish, or language of the Osmanlis, which, through the conquests of that race, has spread far and wide over the whole of western Asia, the Levant, and parts of Europe. The Osman or western Turkish (emphatically Turkish) is more melodious and soft than the former, and so much mixed with foreign elements, chiefly Arabic and Persian, that, were it not for its grammar, which is purely Tartarian, it could hardly be called an original language, but rather a conglomeration of the three respective idioms. Besides, it has also received a large increase of words from other Asiatic and European languages, e.g., the Chinese, Greek, and Italian. It is one of the most widely spoken idioms; not only western Asia, but even the e. of Europe, use this tongue to a great extent for commercial and political transactions. The characters in which it is now written are no longer the original Uigur letters, but the Arabic, the 28 characters of which have been increased by the four additional Persian characters—produced by further diacritical points, and a new one of their own, amounting in all to 33, which are written from right to left, as is the case in all (save one) Semitic languages. But this alphabet is not well suited to a language composed, like this, of elements belonging to the three great families of speech, viz. Semitic, Indo-European, and Turanic. Neither the vowels nor the consonants are adequately represented in all cases. Occasionally, however, it is also written in Armenian characters, which renders its sounds much more faithfully. There is no definite article or gender. The plural is indicated by a final *lar* or *ler*, and the cases are formed by the addition of *ung*, *eh*, *i*, *den*, and *le* for gen., dat., accus., abl., and instrumental respectively; which are, in plural, affixed to the *lar* or *ler*. The adjective has no flexion, but is placed unchanged after the noun. Diminutives are formed, somewhat like in Italian, by suffixes. The comparative and superlative are formed by circumlocution. The personal pronouns are without gender, and their declension is like that of the nouns. The

possessive pronouns are made by suffixes. The Turkish verb is of a very complex nature. There are seven *genera* (active, passive, negative, impossible, causal, reciprocal, reflexive), all of which are formed by certain monosyllables affixed or prefixed. The root of the verb is the second person singular imperative, to which the infinitive affix *mak* or *mek* is joined. The moods and tenses are formed chiefly by the addition of the respective forms of the auxiliary verb *olmak*, to be. Apart from this, there are special particles to express the optative, conjunctive, etc. Conjunctions are either formed by gerundives or possessive forms, or they are borrowed from Persian and Arabic. Adverbs are formed by certain suffixes. The Turkish construction is most peculiar; the genitive always precedes the nominative, and the verb always stands at the end. All this gives the Turkish style a peculiarly artificial and inverted appearance, and often a sentence cannot be in the least comprehended until it is quite finished. Oriental flourishes, and allegorical figures of speech, with which Turkish is very lavish, do not tend to facilitate the study of the language.

The original literature of Turkey is to be found in the scanty remains of the Uigur period. That remote eastern branch of the Turkish family had, after their emigration from their homes, s. of the lake Baikal, to the Tangu Tagh, played a foremost part in the contests and migrations of Central Asia, until they disappeared in the Mongol empire about 1200 A.D. They were acquainted with Chinese literature, and had adopted the Buddhist doctrines to a certain extent, and their scanty literary relics bear traces of these influences. When, however, the Turks, in the 11th c., began their conquest of the countries of Mohammedan Asia, they learned to appreciate the literature of Persia, then beginning to grow up in its full glory; and ever since, Turkish literature and Turkish language have retained a strong Persian impression. Two branches of Turkish literature are usually distinguished—first, the Eastern or Jagataian, which chiefly flourished between Timur's and Baber's time (1400–1530). Mir Ali Shir, the vizier of sultan Hussein, is the most renowned poet of this period. He also collected the most ancient Jagatai poems. Sultan Baber, also belonging to this epoch, wrote memoirs of his life and time (translated into English), which are of considerable importance. The other or Turkish literature, principally so called, is exceedingly rich, but hardly deserving the name of an original literature, it being for the greatest part, a mere imitation of Persian and Arabic models. Of early writers, deserve special mention Sheikhî, a romantic poet and physician, and Soleyman Tchelebi. In the 16th c., the most flourishing period of Turkey, we find Meshîhî, the poet; Kemal Pasha Zadeh, the historian and jurist. In history, we have, besides annalists like Saad-ed-Din, historians like Mohammed Effendi. Of the same epoch is Lamîî, who excelled in many branches of literature, besides being an accomplished translator of Persian poets. Fasli (d. 1563) and Baki, the chief of Turkish poets (d. 1600) conclude this period, which is followed by another of great activity, but of inferior rank. It boasts of Nebî, the poet; Nefî, the satirist; but above all, Hadjî Khalîfah (q.v.), the eminent historian, geographer, and encyclopædist. Raghib Pasha stands out in the 18th c., together with Said Rûfî Effendi, and a number of smaller writers. Little is to be told of the present stage of Turkish literature; but there is a great activity now visible in the province of educational works, and the reproduction of ancient writings; a feature which augurs well for the future. David's (Lond. 1836), Redhouse's (Par. 1846), and Kasem-Beg's (Kasan, 1845; Ger. by Zenker, 1847) are the best known Turkish grammars; and Kieffer and Bianchi's (*Dictionnaire Turco-Française*, 2 vols., Par. 1835), as well as Redhouse's and Zenker's, among the best dictionaries of the Turkish language.

TURKISTAN', "the country of the Turks," called also *Jagatai*, and by the Persians *Turan*, is an extensive region of Central Asia, stretching from the Caspian sea eastward to beyond Lob-nor (long. 110° e.), and from Siberia and Dzungaria southward to Persia Afghanistan, and Thibet. Until quite recently, it was supposed that the Bolor Tagh (q.v.), a mountain chain of the first magnitude, running n. and s., divided it into two parts. English explorers entering Turkistan from the s., and Russians from the n., have shown that no such range exists. Its place is taken so far, however, by a lofty table-land, the Pamir Steppe, which, sloping gently toward the e. and w., separates the rivers running eastward to the desert of Gobi from those which run to the sea of Aral. It separates Turkistan into a western and eastern portion.

WESTERN TURKISTAN, *Great Bukharia*, or simply *Turkistan*, or *Turan*, consists of the great hollow plain of the Caspian and Aral seas, which occupies its w. and center, and of the hilly and well-watered districts formed by the ramifications of the Thian-shan mountains and Hindu Kush. The plain is composed of deserts of loose shifting sand, interspersed with oases where a subsoil of clay renders the formation of lakelets of rain possible; strips of fertile land along the banks of rivers, and occasional tracts clad with coarse thin grass; the eastern districts abound in valleys of remarkable fertility. The climate varies on the plains from extreme cold to burning heat, and though, in the eastern highlands, the cold is almost as intense in winter, the heat of summer is much less. The rivers of Turkistan are the Sir-Daria (see JAXARTES) and Amu-Daria (see OXUS); the Zer-Afshan, which rises on the s. of the Asfera-tag, and flows westward for 400 m., terminating in a small salt lake or marsh near Bokhara; and the Murghab, which rises in the mountains of Ghur, and after a w.n.w. course of 450 m., loses itself in a

marsh beyond Merv. The vegetable products of the country are fruits, grain, cotton, flax, hemp, and tobacco. Silk is also produced in considerable amount. Forests can hardly be said to be at all represented in this extensive region. Salt is abundant, large tracts of desert being strongly impregnated and even crusted over with it; and sal ammoniac is common. Agriculture, and the breeding of the domestic animals, are the occupations of the great mass of the population; but manufacturing industry is also considerable. The produce consists of cotton, silk, linen, and woolen goods, slagreen (superior to that manufactured in Europe) and other kinds of leather, paper made of raw silk, carpets, and a few sabers, knives, and rifles.

Turkistan is divided into Khokan (q.v.), now the Russian province of Ferghana, in the n.e.; Khiva (q.v.), part of which is now Russian territory, in the w.; Bokhara (q.v.) in the e. and center; Kunduz or Badakshan (q.v.) and Balkh (q.v.) in the s.e.; and the tracts lying n. of the Persian frontier. The population of Western Turkistan has been estimated at 4,000,000. It consists of various races—Uzbeks (q.v.), the dominant race, Turcomans, Karakalpaks, Kirghis (q.v.), Sarts or Tajiks, Persians, Kiptchaks, and a few Arabs, Hindus, and Jews. Of these the Sarts or Tajiks, the original inhabitants of the cities, are of ancient Persian stock, and along with the Uzbeks, Hindus, and Jews form the settled population; the Persians are either slaves, or, being introduced into Turkistan as such, have obtained their freedom, and settled in the country; the other races are mostly nomad and predatory. The prevalent religion is Mohammedanism, and most of the tribes are Sunnites. A few Sheehs, Sufis, and Buddhists are also found.

Turkistan has played an important part in Asiatic history from the very earliest times. The contests between the Iranian and Turanian races occupy a prominent place in Firdusi's sketch of the semi-mythical traditions of Persia; and the earliest light of history shows us Bactriana (Balkh) and Sogdiana (Bokhara) as well-cultivated and populous countries, generally attached to the Persian empire, and inhabited by Persians, to whom most of the prominent cities of Turkistan owe their origin. With Persia, Turkistan passed into the hands of the Macedonians, who made Bactria an independent Greek kingdom, while the rest was in possession of the Parthians. Under the Sassanides, the Persian boundary was again advanced to the Jaxartes; but the gradual gathering of Turkish tribes from the n.e. on the right bank of that river, led to a constant state of warfare on the frontier, which ultimately resulted in the occupation of *Maver-ul-neher* ("the country between the rivers"—i.e., the Oxus and Jaxartes) and of Khaurezm (Khiva) by the invaders. In the 8th c. of the Christian era, the Arabs possessed themselves of Turkistan, and during the decline of the caliphate, it became the seat of various minor dynasties, as the Samani (q.v.) in *Maver-ul-neher*, and the shahs of Khaurezm, and after a brief union with the Seljuk empire in Persia, was mostly united to Khaurezm, and along with it overrun by the Mongol hordes under Genghis Khan (q.v.), on whose death it became one of the four divisions of his vast empire, and was allotted to his son Jagatai. On the decline of Jagatai's dynasty, Timûr (q.v.) rose to supreme authority in Turkistan, and in the course of a 25 years' reign, made it the center of an immense empire, which stretched from the Hellespont to the frontiers of China, and from Moscow to the Ganges. This period was the golden age of Turkistan; its powerful monarch was never weary of adorning its cities with the spoils of victory; colonies of learned men, skilled artisans, and all whose knowledge or abilities could be of service to his subjects, were either transferred to Turkistan from the countries he had conquered, or induced by the most munificent offers to settle there; till under him and his more immediate successors, Samarkand became a focus of enlightenment and learning. But after the death of shah Rokh, Timûr's youngest son, the empire was split up into numerous fragments; and after a time a new dynasty snatched Persia from Timûr's family, while the Uzbeks, under Sheibani Khan, drove them (1500) from the country n. of the Amu-Daria; one of the expelled princes, Mirza Baber, who had ruled in Ferghana (the s. half of Khokan), subsequently founding the "Great Mogul" empire in Hindustan. The Uzbek empire generally included Badakshan, Herat, and Meshed; but these were lost on its division in 1658 into various independent khanates. Khiva was conquered by Nadir Shah in 1740, and Bokhara limited to the n. bank of the Amu-Daria; but the Kirghis of the Little Horde restored the independence of Khiva, which they ruled till 1792, when the present Uzbek dynasty obtained the throne; and shah Murad (1806-22), celebrated under the appellation of *Beggee Jan*, effectually re-established its former extensive sway to the Bokhariot scepter. Khokan, after emancipating itself from the authority of Sheibani's successors, was incorporated with Bokhara; but afterward united with the states of eastern Turkistan; and on their conquest by China, resumed its independence. The recent history of Turkistan records a series of wars between Bokhara and Khokan, and Bokhara and Khiva, in which the Bokhariots had generally the advantage, owing to the aid of the Turkomans of the southern desert, whom they subsidize; the raids of the Turkomans along the northern frontier of Persia; the advance of the Afghans from the s.e.; and the progress of Russian conquest from the n. and west. To explain the Turkoman raids, a few additional words on the geography of Turkistan are necessary. Between the deserts of Turkistan and those of Persia lies a long and fertile tract running from the s.e. of the Caspian to Herat, the "key to India;" over it pass the great routes from western to eastern Asia. North of it, chiefly in the deserts, dwell the Turkomans, a population of 1,000,000 of savage brigands and man-stealers,

constantly engaged in marauding expeditions against the northern Persians. They have desolated the frontier, and the atrocities they commit far exceed anything recorded of the African slave-trade. In 1860, Hanza Mirza, an uncle of the present shah, marched against them, but was defeated in attempting to capture their intrenchments in a marsh. On that occasion, 15,000 Persians and 30 guns were taken by the Turkomans. In 1865, a more successful expedition proceeded against Saraks, and the guns were recovered. Still the northern routes are in the hands of the Turkomans, more especially that leading by the Daman-i-koh hills; and so late as 1872, reports appeared of Turkoman raids in northern Persia. The south-eastern part of Turkistan has also been the scene of recent strife. The Afghans have invaded it for the recovery of possessions they claimed n. of the Hindu-Kush. In 1850, they took Balkh and Khulm, and in 1859, Kunduz, Badakshan, at the same time submitting to pay a large tribute. The English and Russian governments seem now to recognize the claim of the Afghans to fix their frontier at the Oxus (see debate in house of commons, April 22, 1873). The Russians bid fair soon to absorb all that remains of independent Turkistan. In 1864, they invaded Khokan, and took Tashkend and Khokan. A struggle followed with Bokhara. On May 20, 1866, was fought the battle of Irjar, the most important event in the recent history of Turkistan. The emir had to flee for his life, leaving his camp in the hands of the enemy. In 1868, the Russians, 8,000 men, again advanced and crossed the river of Samarkand. The troops of the emir, 40,000 men, took to flight when they saw the Russians approach with their dreaded artillery, and on June 14 a treaty was concluded, by which Bokhara transferred to Russia Samarkand and all the territory n. and e. of it. Khiva still remained independent in the midst of its deserts. But early in 1873 an expedition in four divisions set out from the Russian frontier posts against Khiva, which fell in June of that year, after no great resistance. A great part of Khivan territory n. of the Amu-Daria was ceded to the conquerors; and after a fierce struggle in 1875 and 1876 with the warlike inhabitants of Khokan, which is now the Russian province of Ferghâna, Russia formally annexed the whole. The news of the fall of Khiva was welcomed in this country as a triumph of civilization over barbarism; but the further annexation of Khokan provoked the fear that Russia will go on to annex other territories now in the hands of the Turkomans, including the northern routes to Herat; that she will convert the Turkomans into a great army of horsemen, under European officers, the most formidable in the world, and prepare for further conquests, threatening alike our commerce and influence in the east.—See *A Journey to the Source of the Oxus*, by J. Wood (1872); *History of Bokhara*, by A. Vambéry (1873); *Quarterly Review*, April, 1873; Schuyler's *Turkistan*; and several articles in the *Geographical Magazine* of 1875 and 1876.

EASTERN TURKISTAN, known also as *Upper Tartary*, *Chinese Turkistan*, *Little Bukharia*, and *Turfan*, is bounded on the n. by the Thian-shan mountains, on the w. by the Pamir table-land, and on the s., by the highlands of Thibet or Cashmere. Toward the e. it sinks to the desert plain of the Gobi, round the western bay of which it forms a vast crescent-shaped oasis from 4,000 to 5,000 ft. in elevation, drained by the tributaries of the Tarim. This river flows eastward into the desert, and empties itself in the Lob-nor, after a course of 1500 miles. The Lob-nor, a lake, or rather series of lakes and marshes, was visited by col. Prejevalsky in 1877. The region around it is very desolate and unattractive. Mr. Shaw, the first Englishman who visited eastern Turkistan, gave a very enthusiastic account of its capabilities as a field for English commerce as it was when under the late emir, YakooB Beg (see his report, 1871). Mr. Shaw described the plains as covered with corn-fields and orchards, though their fertility is dependent on irrigation. Canals ramify the country, sometimes crossing one another at three levels. But large areas are very unproductive; and though there are numerous villages and towns, some of them large, the population of the country as a whole—probably some 600,000—is but thin. The country produces gold and abundance of silk; and the inhabitants are skillful in making gold and silver stuffs, carpets, and linen, cotton, and silk goods. The political capital is Kashgar; the commercial capital, Yarkand. In the latter are numerous colleges and schools; in both there used to be an active trade, with resident representatives of most of the nations of Asia. But since the reconquest of the country by China, anarchy prevails, and trade is for the time being destroyed; all the more as Kuldja, taken by the Russians from the rebels against Chinese authority in 1871, has been retained by Russia, in spite of Chinese protestations. In 1879, however, it was understood that Kuldja was to be restored to China. The inhabitants speak Turkish, but are said to be of Persian descent. Little is known of eastern Turkistan previous to its conquest by Genghis Khan; but after the decay of his empire into petty states, among which are Kashgar, Yarkand, Aksu, and Khoten, the chiefs of these were constantly quarreling with each other—a temporary peace being occasionally produced by their subjection to some powerful neighbor—till several of the leaders, with the Yarkand prince at their head, invited the Chinese to take possession of the country, and in 1758 it became a province of China. In 1864, however, a mutiny among the Chinese troops induced the dispossessed native chiefs to stir up a Mohammedan insurrection. They invited a Khokan prince, Buzurg Khan, to assume the government. Through his lieutenant, YakooB Beg, he dispersed the Chinese garrison left to defend the fort of Kashgar. But the lieutenant soon superseded him, and became sole emir, under the title of Athalik Ghazi. He possessed civil as well as military capacity, and raised the country to a

state of considerable prosperity. He sent an envoy to Calcutta in 1872, and in 1873 sir T. D. Forsyth visited Kashgar from the Indian government. But the emir's position did not secure more intimate relations. He had since 1869 successfully resisted the encroachments of Russia, but in 1876 the Chinese again advanced, defeated him, and retook their old province in 1877. The emir died shortly after. See Forsyth's *Report* (1875); *From Kulja, across the Tien Shan to Lob-Nor*, by col. N. Prejevalsky (1879); *Boulger's Life of Yakoub Beg* (1878).

TURKMANS HAI, a village of Azerbaijan, 65 m. e.s.e. from Tabriz, is the place where, on Feb. 23, 1828, was concluded the treaty between Persia and Russia, by which the former resigned to the latter the provinces of Erivan and Nakchevan.

TURKS, the name of a numerous, important, and widely-spread family of the human race, members of which are to be found as well on the banks of the Lena in Siberia, as on those of the Danube and the shores of the Adriatic in Europe. The Turks belong to the second of Blumenbach's five great divisions of mankind—viz., *Mongolians*; and to the first, or *Mongolidae*, in Dr. Latham's threefold classification. In this latter classification, the Turks form a branch of the Turanian stock of Altaic Mongolidae. Their geographical distribution, according to Dr. Latham, is as follows: "1. As a continuous population. East and w.; from the neighborhood of the lake Baikal, 110° e. long., to the eastern boundaries of the Greek and Slavonic countries of Europe, about 21° e. long. N. and s.; from the northern frontiers of Thibet and Persia, about 34° n. lat., to the country n. of Tobolsk, about 59° n. lat. 2. As an isolated population. Along the lower course of the Lena, and the shores of the White sea, chiefly within the Arctic circle. 3. As portions of a mixed population in China, Thibet, Mongolia, Persia, Armenia, the Caucasian countries, Syria, Egypt, Barbary, Greece, Albania, and the Slavonic portion of Turkey in Europe." The names Tourkoi, Turkai, and Turcæ occur in some ancient authors as applied to a Scythian people dwelling in Asiatic Sarmatia, and it is very likely that the Scythians of antiquity were allied in blood with the numerous existing Turkish tribes, if not absolutely their ancestors. The original seat of the Turks was probably upon the northern slopes of the Altai range, from which, while a portion emigrated into independent Turkistan, others going s.s.e., established themselves upon the confines of the Chinese empire. MM. Abel-Rémusat, Klaproth, Ritter, and other high authorities concur in tracing all the now existing Turkish tribes to the Hiong-nu, a powerful nation who, prior to the Christian era, threatened to overrun and subjugate China, and who then occupied the whole of the vast region now called Mongolia, from the n. of China to mount Altai. Dr. Prichard coincides in this opinion. The Hiong-nu (or *vile slaves*, so called by the Chinese), indeed, for some time succeeded in establishing a kind of rule in China, and even intermarried with the imperial family; but about the commencement of the Christian era, their power in China began to wane, and before the end of the 2d c. they were driven back as far as independent Turkistan. "After the fall of the empire of Hiong-nu," says Prichard, the Turks "are known in Chinese history by the name of Thu-k'üi, or Turks, and Whey-ou-eul, by Europeans written Huy-hurs, and more correctly, Uigours. The Uigours, or eastern Turks, whose history has been elucidated by Abel-Rémusat, are the link of connection between these more remote nations and the Seljuki and Osmanli Turks, who are known to European historians."

After the fall of the Hiong-nu empire in China, the tribes who composed its strength separated, some maintaining themselves of their acquired settlements, and even conquering portions of China; but by far the greater number spread westward over western Mongolia, e. and w. Turkistan, and southern Siberia, and gradually lost their power and unity as a nation. Out of this *débris* of a fallen people arose, in the 5th c., the great empire (the empire of Kiptchak) of the Thu-k'üi, which contested the supremacy of central Asia with the Chinese on the e., and the Sassanidæ (q.v.) on the w., ultimately falling in 744 before the Hœi-he, a confederation of Turkish tribes which had hitherto been subject to it. The Hœi-he, attacked in the w. by the Hakas (the ancestors of the present Kirghis), yielded to their assailants in 848, but retained their power e. of the Bolor-tagh, and for 150 years longer ruled supreme from that range to the Hoang-ho. During the eight centuries succeeding their expulsion from China, a regular though slow progress westward had been maintained by some of the Turkish tribes, a portion of whom appear (5th c. A.D.) in southern Russia, and on the northern frontier of the Byzantine empire, driving before them the kindred race of the Avars. They were found in Syria and Mesopotamia in the 7th c., and about the same time wandered into northern and eastern Khorasan. But the seat of power of the Turkish race still was in central Asia, whence in the 10th c. the Seljuks (q.v.) emerged, conquering Persia, Syria, and Asia Minor, and establishing an empire which reached from Constantinople to the borders of Mongolia. The subdivision of the Seljuk empire in south-western Asia led to its gradual absorption by the Khaurezmians in the n., and the Kurds in the w., till the irresistible tide of Mongol invasion under Genghis Khan (q.v.), rolling over central and western Asia, and the e. of Europe, completely overwhelmed Turkish dominancy. The great empire of Timur (q.v.) was Turk, with a strong infusion of the Mongol element, the residue of Genghis's irruption; and its destroyers, the Uzbeks (q.v.), and the various other tribes—Kliirghis, Kiptchaks, Turkomans, etc.—which now possess its

extensive domains, are also of Turkish race. The Osmanli-Turks are descended from a portion of the Turkish tribe of the Kayi, which fled from its settlements in Khorassan before the Mongols, and took refuge with the Seljuks of Iconium. See OTTOMAN EMPIRE, SELJUKS, etc.

The following is the enumeration of the principal Turkish tribes given by Dr. Latham: "1. *Uigurs*.—On the Mongol frontier. Belonging to China. The Uigurs were the first Turks that used an alphabet. Little known. 2. *Turks of the Sandy Desert*.—Conterminous with Mongolia and Tibet. 3. *Turks of Khoten, Kashgar, and Yarkend*. 4. *Kirghis*.—Independent Tartary. The Kirghis (q.v.) form a portion of the population of the highest table-land in Asia—perhaps in the world—Pamir and the source of the Oxus. 5. *Uzbeks* (q.v.).—The Turks of Bokhara. 6. *Turkomans*.—The Persian frontier of Independent Tartary from Balkh to the Caspian. Pastoral robbers. 7. *Ottoman or Osmanli*.—The Turks of the Turkish empire. 8. *Nogays*.—The Turks of the parts between the Black sea and the Caspian, n. of Caucasus. 9. *Turks of the Russian Empire*.—Bashkirs, Teptyars, Baraba, etc. With all these, although the language is Turk, there is good reason to believe that the original substratum is Finn. With the Bashkirs, this is generally considered to be the case. 10. *The isolated Yakuts of the Lena*."

In physical appearance, all these tribes, with the exception of the Ottoman Turks, partake more or less of the Mongolian type. They have in general a broad, flat face, with prominent cheek-bones, the head from side to side nearly equal to its length from the forehead to the occiput, the nose flat, the eyes small, the color of the skin yellowish, straight hair, little or no beard, and stature undersized. It is among the nomad and agricultural Turks that these characteristics are most prevalent, while among the more civilized they almost entirely disappear. Dr. Prichard quotes lieut. Wood's account of the Kirghis as a good average description of the primitive Turkish tribes. "In stature," he says, "the Kirghis are under the middle height; of a *kyl* numbering seven men, the tallest was 5 ft. 5½ in. in height. Their countenance is disagreeable; the upper part of the nose sinks into the face, leaving the space between their deeply seated and elongated eyes without the usual dividing ridge; the brow immediately above the eye is protuberant, but starts back more abruptly than in Europeans; their cheeks, large and bloated, look as if pieces of flesh had been daubed upon them; a slender beard covers their chin; and in those individuals who have more luxuriant hair, the beard has a natural curl. Their persons are not muscular. Their complexions are darkened by exposure to all weathers rather than by the sun. The women are rather good-looking, and of delicate form, like the Hazaras, and make good wives." The Turks of the Turkish empire, especially those of the upper classes, differ considerably from the type here described. The Ottoman Turks, in fact, both in feature, height, and general physical structure, bear a strong resemblance to other European nations. This is accounted for chiefly by the custom now prevalent among them for ages of intermarrying with Circassian females.

The various Turkish tribes speak very nearly the same language; "so much so, that the Yakut of the Icy sea is said to be intelligible to the Turks of central Asia, and even of Constantinople." In religion, the Turks are for the most part Mohammedans; but the Yakuts are Shamanists; the Turks bordering on the Chinese empire are Buddhists; and those of Siberia Christians of the Russo-Greek church.

TURK'S ISLANDS. A group of small islands in the Bahama archipelago, n. of Hayti; pop. about 2,000. The chief island is Grand Key or Turk's. The sea-ports are East Harbor, Caicos, Salt Cay, and Grand Turk. Much salt is exported, and there is a considerable floating population which comes every year from the Bermudas to rake salt. The soil of the islands is entirely barren. The group is governed by Jamaica.

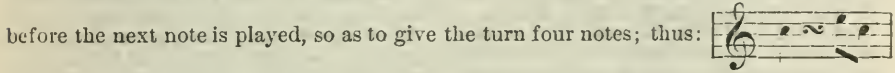
TURMERIC, *Curcuma longa*; see CURCUMA, a plant of the natural order *scitamineæ* a native of the East Indies, much cultivated both in India and in Cochin-China. The leaves are lanceolate, sheathing each other at the base, about a foot long; they spring from the crown of the root, and from their center rises a short leafy spike, with small cream-colored flowers. The root is divided into several fleshy fingers, oblong, and as thick as a man's thumb, sometimes crooked when young, and the root then abounds in a kind of arrow-root; but in a more advanced stage, it contains in large quantity a peculiar, resinous, yellow substance, which is used as a dye-stuff, and for other purposes, and is called *turmeric*. It appears in commerce in the form of dried roots, or as a powder. It depends for its value chiefly on a resinous principle called *curcumin*, which is scarcely soluble in water, but easily soluble in alcohol and ether. The yellow color obtained from turmeric is not very durable, although it is employed as a dye both for silk and wool. Chemists make much use of turmeric as a test for alkalies, which change its yellow color to reddish brown, as do also their carbonates and phosphates, some of the alkaloids, and boracic acid. Turmeric test-paper is made by immersing unsized paper in tincture of turmeric. It is much employed in the east in medicine, as a gentle laxative, diuretic, and stimulant. It is also much used as a condiment with many kinds of food, and is the principal ingredient in *curry-powder*. For its cultivation, turmeric requires a rich friable soil, and a situation not liable to be flooded. It is propagated by cuttings of the root, which are planted at distances of eighteen in. or two feet. It is planted in April or May, and the crop is gathered in December. This kind of turmeric is sometimes distinguished by the name of **LONG TURMERIC**; and


the name of **ROUND TURMERIC** is given to *kæmpferia pandureta*, a plant of the same order, also a native of the East Indies, the roots of which are shorter and rounder, but otherwise of very similar quality. They are not nearly so much an article of commerce as the other kind, but are particularly valued for the preparation of an artificial gold varnish, as they yield a better color than the long or true tumeric. The Arabic name of tumeric is *kurkum*, whence *curcuma*.

TURN, in music, an embellishment formed by the adjoining notes above and below combined with the principal note, and indicated by the sign ∞ . Thus




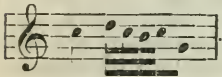
Should another than the principal note follow the turn, the principal note is added before the next note is played, so as to give the turn four notes; thus:



is played . In either of these cases, the turn must be played

during the time of the principal note. Bnt when the sign ∞ is placed above or below the principal note, the first note of the turn takes the place of the principal, which is

played in combination with the others; thus  is played



TURNAU (Boh. *Turnáv*), a walled t. of Bohemia, circle of Jung-Bunzlau, on the e. bank of the Iser, 50 m. n.e. of Prague. It has a church, built in 1825, which is reckoned one of the most beautiful in Bohemia. Turnau has manufactures of cotton, woollens, and more particularly artificial gems, which are exported in great quantities to the United States. Pop. 4,700. Here was fought (July 1866) a battle between the Prussians and Austrians, in which the former were victorious.

TURNBULL, ROBERT, D.D., b. Scotland, 1809; graduated at the university of Glasgow; became a Baptist; settled at Danbury, Conn., 1833; pastor of a Baptist church in Detroit, Mich., 1835; of South Baptist church, Hartford, Conn., 1837; of Harvard street church, Boston, 1839; First Baptist church, Hartford, 1845. He was a graceful writer, and published *The Theater; Olympia Morata; Vinet's Vital Christianity; The Genius of Scotland; The Genius of Italy; Theophany, or The Manifestation of God in Christ; Christ in History; Pulpit Orators of France and Switzerland*; edited sir Wm. Hamilton's *Discussions on Philosophy*.

TURNBULL, ROBERT JAMES, 1775-1833; b. Florida; his father was the founder of a Greek colony at New Smyrna, Fla., but before the revolution forfeited his grants on account of his adherence to the popular side. The son was educated in England, became a Charleston lawyer, and practiced there till 1810. He was conspicuous in politics, prominent in the nullification movement of 1832-33, and wrote pamphlets on the subject. A monument was erected to his memory in Charleston.

TURNBULL, WILLIAM, 1800-74; b. Md.; graduated at West Point, 1819; commissioned in the artillery, served in the topographical corps, and was promoted to a captaincy in the topographical engineers in 1831. He had charge of the construction of the Potomac aqueduct, 1832-43. This was the first work of the kind in this country in which the piers were laid upon the rock-bed by means of coffer-dams, and by surmounting the difficulties of its construction, col. Turnbull gained high repute as an engineer. In the Mexican war he was with Scott as chief topographical engineer, and took part at Contreras and Churubusco. Among his more important professional works were the building of the New Orleans custom-house, and the Cape Fear river improvements.

TURNER, a co. in s.e. Dakota, consisting of fertile prairies; 600 sq.m.; pop., '80, 5,320—2,857 of American birth. Co. seat, Swan Lake.

TURNER, JOSEPH MALLARD WILLIAM, the greatest of British landscape painters, was born at 26 Maiden lane, Covent Garden, London, in 1775. The precise day of his birth is unknown; but an approximation to it is furnished by his baptism, which is registered in the parish church as of date May 14 of that year. He was the son of a barber, and received an exceedingly defective education. His turn for art showed itself very early, and drew attention to the boy. To a Dr. Monro, in particular, who gave him access to his excellent collection of water color drawings, and otherwise kindly furtherance, he used afterward to express his obligations. In 1789, he became a student at the

Royal academy, where, doubtless, he learned something; but throughout he seems to have been indebted less to any formal teaching than to the tentative efforts of his own singularly original genius. In 1787, when only twelve years old, he exhibited two drawings at the Royal academy. Again, in 1790, he exhibited; and thence onward till his death, with intermission of only one or two years, his pictures were regularly to be found on the walls. His success is sufficiently shown in the fact that so early as 1799 he was elected an associate of the Royal academy, and only three years afterward attained the full dignity of academician. The honor was worthily bestowed on one whose claim was already admitted as the first landscape painter of his time; but his election in 1807 to the post of professor of perspective could scarcely be considered so judicious. A man so abnormally illiterate that his simplest note included a crop of solecisms, was not likely to succeed as a lecturer; and as a lecturer he failed utterly. The knowledge which he abundantly possessed, he could not in the least communicate; and after a very few years, he ceased to make the attempt. In the exercise of his art, Turner traveled much; he was frequently in Scotland, France, Switzerland, and the Rhine countries; and in 1819, 1829, and 1840, he paid visits to Italy. His industry was almost as unexampled as his genius. To the exhibitions of the Royal academy, he contributed in all 259 pictures; but among these, many of his finest works were not included; and in another branch of art, the amount of his achievement was extraordinary. In 1808, he commenced the publication of his famous *Liber Studiorum*, a series of engravings from original designs, which ranks as one of his most important undertakings; to this is to be added his *Scenery of the Southern Coast, England and Wales, Rivers of England, Rivers of France*, etc.; and besides, his services were continually in request as an illustrator. The illustrated edition of Rogers's *Poems* is his most celebrated work in this kind, and is quite unique in magnificence. At his death, which took place Dec. 19, 1851, at Chelsea, where his few last years were passed in a small house by the river side, it was found that he had bequeathed to the nation the noble collection of his works, which now occupies a room in the National gallery, and remains a permanent monument of the power and splendor of his genius, if also of its occasional eccentricity and extravagance. The large fortune, amounting to something like £200,000, which he had amassed by his industry and thrift combined, he left to found an asylum for decayed artists; but owing to some technical defect in his will, this purpose could not be carried out.

Of the genius of Turner, and the various phases through which it was developed till it sunk in the decay and delirium obvious in the work of his few last years, we cannot here attempt to treat. In the eloquent pages of Mr. Ruskin's *Modern Painters*, the subject will be found thoroughly discussed. There are lives of Turner by Walter Thornbury (1861) and by P. G. Hamerton (1879). The picture presented, especially by the former, is a somewhat dark and painful one. This creator of the beautiful on canvas was in his character and way of life by no means so surprising a revelation of it. He was coarse, sensual, sordid, avaricious: of his inordinate passion for money, many odd anecdotes are extant; but it is only fair to say, that by the few friends who knew him intimately, he was held to be essentially a man of kindly and generous nature. He lies buried in the crypt of St. Paul's, beside sir Joshua Reynolds.

TURNER, PHILIP, 1740-1815; b. Norwich, Conn.; pursued his early studies under the direction of Dr. Elisha Tracey, with whom he studied medicine; served as assistant-surgeon under gen. Amherst at Ticonderoga, 1759; settled in Norwich, 1763; surgeon of the Connecticut troops before Boston, 1775. He attended the army through some of the bloodiest battles of the war; surg. gen. of the e. dept., 1777; afterward surgeon to the staff of the U. S. army, stationed on York island. He married a daughter of Dr. Tracey.

TURNER, SAMUEL HULBEART, D.D., 1790-1861; b. Philadelphia; educated at the university of Pennsylvania. He took orders in the Protestant Episcopal church, and after officiating as rector of churches in Chestertown, Md., New York, and Brooklyn, became in 1818 professor of historic theology in the New York general theological seminary, and in 1821 professor of biblical learning and scripture interpretation. He was also professor of Hebrew in Columbia college after 1830. Among his works are: *Notes on the Epistle to the Romans* (1824); *Companion to the Book of Genesis* (1841); *Parallel References of the New Testament* (1848); *Thoughts on Scriptural Prophecy* (1852).

TURNER, SHARON, the Anglo-Saxon historian, was b. in London, Sept. 24, 1768, article to an attorney at the age of fifteen, and succeeded his master in the business before the period of his clerkship had expired. He continued, however, to gratify his literary tastes; and after years of hard reading and patient collection of materials, published, 1799-1805, a *History of the Anglo-Saxons*, in 3 vols, a work, with all its imperfections, that has given its author a permanent place in English literature. Other writings of Turner's are: *The History of England from the Norman Conquest to 1509* (1814); *History of Henry VIII.* (1826); and *Reigns of Edward VI., Mary, and Elizabeth* (1829); all of which were subsequently republished together under the title of *History of England from the Earliest Period to the Death of Elizabeth*; *Sacred History of the World as displayed in the Creation and Subsequent Events to the Deluge* (1832 et seq.); a volume of essays and poems, etc. Turner died Feb. 13, 1847.

TURNER, THOMAS, b. Va., 1808; entered the navy as midshipman, 1825; rose through successive grades to be rear-admiral, 1868. He served in the Mexican war, was actively engaged at Tuspan in 1847, commanded the sloop-of-war *Saratoga*, and in 1860 took two prizes, Spanish steamers in the harbor of Auton Leyardo, Mexico. During the war of the rebellion he commanded the frigate *New Ironsides* in Charleston harbor, 1863; com. South Pacific squadron, 1869-70; retired, 1870.

TURNER, WILLIAM WADDEN, 1810-59; b. London; emigrated to New York, and became a printer's apprentice. He studied many languages, was librarian of the university of New York, instructor in Hebrew in the Union theological seminary, and librarian of the U. S. patent office. Besides contributions to learned societies and periodicals, he published a translation of Von Raumer's *America and the Americans*, and he translated the most of Freund's *Latin-German Lexicon* for prof. E. A. Andrews.

TURNER'S FALLS, a village in w. Massachusetts; set off in 1866; in Montague township, Franklin co., on the left bank of the Connecticut river; pop. '80, of township, 4,876. It is on a branch of the Vermont and Massachusetts railroad, 2 m. n.e. of Greenfield, 38 m. n. of Springfield. It contains five churches, a national bank, a savings bank, and a newspaper office. The river furnishes extensive water power, having at this point a perpendicular fall of 36 feet. The leading industry is the manufacture of cutlery, with a capital of \$500,000, employing 450 men; other manufactures are lumber, machinery, cotton cloth, turbine water-wheels, and writing paper.

TURÓCZ, a co. in n.w. Hungary, crossed by the Carpathian mountains; 444 sq. m.; pop. about 45,346. Capital, Szent-Márton.

TURNHOUT, a well-built t. of Belgium, province of Antwerp, 34 m. e.n.e. of the city of Antwerp, in the district known as the Campine (see **BELEGIUM**), and the terminus of a branch-line of the Brussels and Antwerp railway. The inhabitants manufacture ticking, and linen and lace goods, cutlery, playing cards, paper, oil, etc. Pop. '70, 14,500. Turnhout is historically noteworthy as the scene of two battles, the first won Jan. 22, 1597, by the Netherlands, under Maurice, prince of Orange, over the Spaniards; and the second, Oct. 27, 1789, by the patriots under Van der Mersch, over the Austrians.

TURNING, the art of shaping wood, metal, ivory, or other hard substances into forms having a curved (generally circular or oval) transverse section, and also of engraving figures composed of curved lines upon a smooth surface, by means of a machine called a *turning-lathe*. This art is of great importance and extensive application in mechanics, the most delicate articles of luxury and ornament, equally with the most ponderous machinery, being produced by it. The art of turning dates from a very early period, and Theodorus of Samos (about 560 B.C.) is named by Pliny as its inventor; but long before this period, the *potter's wheel* (see **POTTERY**) the earliest and simplest form of turning-machine, was in general use, as is evidenced by numerous references in Holy Writ. The immense variety of work performed by turning-machines necessitates great variations in their construction; but their mode of operation is always the same, and consists in fixing the work in position by two pivots or otherwise, causing it to revolve freely round an axis of revolution, of which the two pivots are the poles, and holding a chisel or other cutting-tool so as to meet it during its revolution, taking care that the cutting-tool be held firmly and steadily, and moved about to different parts of the work till the required shape be obtained. Lathes are divided, with respect to the mode of setting them in motion, into *pole-lathes*, *foot-lathes*, *hand-wheel lathes*, and *power-lathes*; with respect to the species of work they have to perform, into *center-lathes*, which form the outside surface, and *spindle, mandrel, or chuck lathes*, which perform hollow or inside work, though this distinction is for the most part useless, as all lathes of good construction are now fitted for both kinds of work. *Bed-lathes* are those used by turners in wood, and *bar-lathes* for the best sort of metal-work; and the small metal center-lathe employed by watchmakers is known as a *turn-bench*.

The primitive and most simple form of lathe for wood-cutting is the pole lathe. It consists of two planks or beams placed horizontally side by side with a narrow space between them, which, being firmly supported at a convenient height, constitute the *bed*; of two uprights or *puppets* rising from the bed, one of them stationary at the left end, and the other sliding along over the slit between the beams, and capable of being fastened at any required point by a projecting tenon and wedge beneath; of a *treadle* below and parallel to the bed; and of an elastic *pole* or *lath* (whence some derive the name lathe) fixed to the ceiling above. This form of lathe is well adapted for turning long thin cylinders of wood, the piece to be turned being held fast at each end by the conical iron or steel point projecting from the inner face of each puppet. Motion is communicated to the work by a cord which is fastened to the lath overhead, wound twice or thrice round the work, and then attached to the treadle below. When the workman presses his foot on the treadle, the work commences to revolve rapidly, unwinding the cord toward the treadle, and winding it up on the side next the pole, causing the latter to bend considerably. During this period the workman has been holding his cutting instrument to the work; but after the treadle has been quite pressed down, he removes his foot, and the reaction of the bent pole causes the work to revolve in an opposite direc-

The *hand-wheel* lathe is similar to the former, but so much larger as to require two workmen, one of whom is employed in setting the instrument in motion by turning a wheel, which corresponds to the wheel F in fig. 1. The *power*-lathe is similarly set in motion by horse, water, or steam power, and is employed for heavy metal-work, as piston-rods, iron columns of various kinds, wheels, artillery, etc. This machine differs from the foot-lathe chiefly in the substitution of rack-work, and wheels and pinions, for the endless band, and for manual labor, in the various adjustments of the machine, such as in moving forward the tail-stock, etc.; and in the mandrel being supported by both puppets of the head-stock. In wood-turning, the wood is first prepared by a hatchet and rasp, must be lightly though firmly pressed against by the cutting-tool; while metal-work must be cleaned from the sand of the mold or scales of the forge, and in turning, requires less care. Soft woods must be made to revolve with great rapidity; very hard woods and brass require much less velocity; wrought iron and copper, still less; steel, a further diminution of speed; and cast iron, the least velocity of all. After the work has been duly shaped, it requires to be polished; and this is effected while it is still in the lathe and rotating, by applying shark's skin to wood, pumice-stone and chalk to ivory and horn, and emery, tripoli, or putty powder to metals.

Hitherto, we have supposed that the axis of revolution of the work is fixed, and consequently that all work has been turned so as to present a transverse circular section; but many other forms of section may be easily obtained. The general mode of obtaining these non-circular figures is by screwing on to the mandrel an apparatus, by means of which the work can be thrown out of the center of rotation at regular intervals; but as each different class of form requires a separate kind of apparatus, it is impossible here to describe the operations in detail. One species, however, known as *rose-engine turning*, and employed for producing involved curvilinear figures, such as appear on bank-notes and on ornamented gold, silver, or gilt work, is so peculiar and ingenious as to call for more special notice. In this species, the standards which support the mandrel are no longer fixed at right angles to the bed, but are capable of oscillating backward or forward in a plane parallel to the plane of rotation of the mandrel, and are so acted on by a spring that when pushed to one side they are at once restored to their former position on the pressure being withdrawn. Suppose, then, a metal wheel with its rim waved or indented, fastened concentrically on the mandrel, and the mandrel, pushed aside by a fixed steel point or roller, applied to the rim of the wheel, the reaction of the spring against the pressure of the roller will keep the latter in close contact with the waved rim throughout, and will produce a definite oscillatory movement of the mandrel, of the chuck, and the work fastened on it, and consequently—the cutting or graving tool being firmly held by the slide-rest—definite deviations from a circle in the lines marked on the face of the work. The wave-rimmed wheel, called a *rosette*, may be replaced by another, and that by a third, and so on till a sufficient number of different waved lines are obtained. A number of rosettes are generally strung at once on the mandrel, and the fixed guide is brought into gearing by means of a steel band called a rubber, with one rosette after another. Similar concentric curves of greater or less perimeter are obtained by removing the slide-rest from, or bringing it nearer to, the axis of revolution.—For more complete information respecting this most interesting machine, and its many varieties of form and application, see article "Turning" in the *English Cyclopædium*, Holtzapffel's *Turning and Mechanical Manipulations* (Lond. 1847-53), and *Tourneur (Manuels-Roret)*, by Valicourt (Paris, 1858).

TURNIP, *Brassica rapa* (see **BRASSICA**), a biennial plant, with lyrate hispid leaves; the upper part of the root becoming, especially in cultivation, swollen and fleshy. It is a native of Europe and the temperate parts of Asia, growing in borders of fields and waste places. It is commonly regarded as a native of Britain, although in most cases of its being found apparently wild, it may be doubted if it has not derived its origin from cultivated varieties. It has been long cultivated, and is to be found in every garden of the temperate and cold parts of the world as a culinary esculent; it is also extensively grown in fields for feeding cattle and sheep. It was cultivated in India long before it could have been introduced by Europeans, and is common there in gardens and about villages. The cultivated varieties are very numerous. In them, the upper part of the root assumes a globose, oblong, or roundish depressed form. Some are common to the garden and the farm, and some of the largest kinds attain such a size as to weigh 20 or 25 lbs. Although the turnip is of great value for feeding cattle, and the introduction of it into general field-culture was one of the greatest improvements ever effected in the husbandry of Britain, it is not very nutritious, no less than 90 to 96 parts of its weight actually consisting of water. Garden turnips are sown from the end of March to the end of August; field turnips generally in June, it being requisite that they should not be sown so soon as to incur a risk of their throwing up flower-stems in the first year, which, when it takes place, prevents in a great measure the swelling of the root, and renders it coarse and fibrous. In the garden cultivation of turnips, the root is generally intended for use in the first year. In dry weather the plants are apt to throw up flower-stems, and so disappoint the hope of the gardener; which is also the case if the seed is sown too early in spring. Moist cloudy weather is most favorable. Garden turnips are sown, and allowed to grow, much closer than field-turnips; being gradually thinned out, and

the thinnings used even when a small size. The varieties both of garden and field turnips are very numerous. The garden turnips are generally of comparatively small size, more rapid in growth, and more delicate.—The SWEDISH TURNIP, or *RUTA BAGA*, which was introduced into cultivation in Britain, from the north of Europe, more recently than the common turnip, and has proved of very great value to the farmer, is regarded by some botanists as a variety of the same species, and by some as a variety of *brassica napus*, but more generally as a variety of *B. campestris*, a species common in corn-fields and sides of ditches in Britain and the north of Europe.

The cultivated turnip grows best in a rich free soil. The mode of culture varies with the soil. Where the soil is light and dry, a smaller amount of plowing, harrowing, and drilling is necessary than on stiff soils. The turnip is not well suited to clay soils, although it is often grown on them. A complete pulverization of the soil is requisite before the sowing of the seed. On light soils, a crop of turnips generally succeeds wheat or oats. Turnip-land is generally made up in raised drills, by the plow, and the seed is sown by the drilling machine, on the top of the narrow ridges, which are about 27 in. apart. Small doses of guano, super-phosphate of lime, crushed bones, or other such manures, produce great crops of turnips. They seem to act chiefly while the plant is young; and when it is further advanced, it derives nutriment from the soil, and even from the subsoil, by deeply penetrating roots, and from the atmosphere by its large leaves. See BONES AS MANURE. The young plants are thinned out by the hand-hoe, to a foot or upward apart, and the ground is stirred and carefully kept clean by the plow or horse-hoe. The turnip-crop is thus of great use in clearing the land of weeds. In many places part of the crop is eaten on the ground by sheep, which are confined to a small part of the field by means of movable fences. It is common to leave one of each three rows of turnips for this purpose, the other two rows being carried to the farm-yard for feeding cattle, or stored. Turnips are stored either in a house or in conical heaps, covered with their own leaves, or with straw and earth. They are sometimes protected from frost by being earthed up in rows by the plow. Some kinds are much more easily injured by frost than others; the Swedish turnips least of all.

The introduction of the turnip as a field crop is one of the most important events in the history of British agriculture. It has rendered possible a rotation of crops, which has been extremely advantageous; and has made the supply of butcher-meat more constant, by providing a supply of winter-food for cattle and sheep, whereas, formerly, all depended on the pasture. Turnip-husbandry was introduced into Scotland from Norfolk in the latter part of the 18th c., but soon attained a development, and was carried to a perfection in Scotland far beyond what it had previously reached anywhere. The climate of Scotland is particularly adapted to it, as is also that of Ireland; moist weather, both in summer and autumn, being suitable to the turnip; whilst the climate of North America is so unfavorable to it that it has not become an important crop there. Of late years, turnip-crops in Britain have suffered very much from the disease called anbury (q. v.), or *fingers and toes*. This is not the case in Norfolk, and the exemption is supposed to be due to the use of clay-marl as a manure; but the whole subject is involved in obscurity. The turnip not unfrequently suffers from a fungus of the genus *botrytis* (*B. parasitica*), allied to that which is supposed to cause the potato disease. It infests plants of rank growth, attacking their roots, which are weakened by the too great luxuriance of the leaves. Plants weakened by drought are liable to suffer from a white mold, a species of *oidium*, which attacks the leaves, and renders the plant worthless. The leaves are devoured by the turnip-fly, turnip-flea, or turnip-beetle (*halitica nemorum*), and by other species of the same genus. The nigger caterpillar, the larva of *athalia spinarum*, also devours the leaves, as well as the caterpillars of white butterflies (*ponti abrassicæ repæ*, and *napi*), and of some moths. The leaves are also mined by the larvæ of several dipterous flies. Several species of aphids suck the juices of the leaves, and one (*A. floris rapæ*) devotes its attention to the young crops in seed leaf, which are also attacked by a rose-chaffer (*cetonia aurita*), and a minute beetle (*meligethes cæneus*). Slugs, snails, and wire-worms are among the enemies of the turnip.

The young leaves of the turnip are good as greens, and particularly those of the Swedish turnip, when it has begun to sprout in spring.

TURNIP-CUTTER, an implement used for cutting turnips for cattle. It is useful, not only as saving the teeth of sheep, which are apt to be much injured by eating turnips, but as preventing waste, for sheep feeding upon turnips scoop out a part, and leave the rest to rot. The oldest and simplest turnip-cutter acts by mere pressure, and is like a large nut-cracker on a stand. Many kinds are now in use, of which perhaps the best are those having knife-edges on the surface of a cylinder or cone, which are brought to act on the turnips by turning a handle.

TURNIP-FLY, a name given to several insects destructive to turnips. It is often given to *altica* (or *halitica*) *nemorum*, also called TURNIP-FLEA, from its skipping or leaping powers, but which is truly a very small beetle, with long and strong hind-legs, and ample wings, of a shining black color, with two yellowish stripes down the wing-cases, and ocherous legs. It swarms in meadows and hedge-rows in most parts of Britain from March to October, the larva feeding on many cruciferous plants. It often commits great ravages in turnip-fields, while the turnips are very young. The female lays her

eggs on the under side of the leaf, and the minute larva mines in the leaf, under the skin, making a tortuous gallery. Farmers sometimes steep the seed of turnips, in order to prevent the ravages of this insect, but no good can be thus done, as the eggs are not in the seed.

The **TURNIP-FLY**, more properly so called, is *anthomyia radicum*, a dipterous insect of the family *muscidae*, and of the same genus with the cabbage-fly and beet-fly. It attacks the root of the turnip, as the cabbage-fly does that of the cabbage, the larva living in the root.

TURNIP SAW-FLY. See **SAW-FLY**.

TURNPIKE ROADS. See **HIGHWAY, TOLL**.

TURNPIKE STAIR, a turret stair revolving round a central newel.

TURNSOLE, a peculiar coloring material consisting of very coarse linen rags, usually pieces of sacking, prepared by cleaning and bleaching, and then dipped into the juice of the leguminous plant called *erosophora tinctoria*, previously mixed with ammoniacal matter, and exposed to the air for some time. It is made in France, but is exclusively used in Holland, but for what is not certainly known: it is said, for coloring cheese, pastry, etc.

TURNSTONE, *Streptopelia interpres*, a bird of the plover family (*charadriade*), very widely distributed, and, indeed, found in almost every part of the globe. It appears in Britain, chiefly as a winter bird of passage, but breeds in the Shetland islands. It frequents the sea-shore, and derives its English name from its habit of turning over small stones with its bill in search of food. It is the only known species of its genus. The eggs, which are four in number, are laid on lonely rocky coasts where there is sparse vegetation. They vary very much in color and markings, and are cunningly concealed. The whole length of the turnstone is rather more than 8 inches. The plumage varies with the age of the bird and the season. In August the plumage begins to get dull.

TURPENTINE is a semi-solid resin which is yielded by various species of pine, and by some other trees when incisions are made into them. The chief varieties of turpentine are *common turpentine*, yielded by *pinus abies*; *Venice turpentine*, yielded by the larch; *Bordeaux turpentine*, yielded by *pinus maritima*; and *Chian turpentine*, yielded by *pistacia lentiscus*. The Venice turpentine, which is regarded as the best variety, occurs as a clear, transparent, pale yellow, viscous mass, of a balsamic odor, and an acrid bitter taste, perfectly soluble in spirits of wine, and increasing in density on prolonged exposure to the air. On distilling it with water it yields a considerable quantity of essential oil, vulgarly known as *spirits of turpentine*. This oil of turpentine (which, from its greater cheapness, is usually obtained from common turpentine) is, after rectification, represented by the formula $C_{20}H_{18}$ and has a spec. grav. of 0.864, and a boiling-point of 320° . It is colorless, transparent, has a strong refractive power, a strong peculiar odor, and a disagreeable acrid taste. It is readily soluble in alcohol, in ether, and in the fixed and essential oils, but is insoluble in water, on which it floats. It is a good solvent for many substances, among which may be especially mentioned sulphur, phosphorus, caoutchouc, and the various resins; and is largely used in many departments of the arts, forming a large proportion of all oil paints. Great quantities are imported into Britain from the United States, where it is mostly yielded by the swamp-pine.

Turpentine is an energetic producer of ozone (q.v.); and on keeping it for a long time in a stoppered flask, which should be occasionally shaken, the odor of ozone is very distinct on opening the vessel. Oil of turpentine forms three hydrates, of which two are solid. Commercial oil of turpentine often consists of a mixture of several isomeric hydrocarbons which act oppositely on polarized light (like the several varieties of sugar). Deville and Berthelot have ascertained that there are various modifications of which this oil is susceptible without its undergoing any change in its chemical composition. Of these, *isoterebenthene* and *metaterebenthene* differ *inter alia* in their boiling-points, and may thus be separated; *terebene* (which has an odor resembling that of oil of cloves) and *colophene* are obtained by acting on the oil with sulphuric acid; and *camphylene* and *terebylene* by decomposing artificial camphor (which is a combination of the oil with hydrochloric acid) by means of quicklime.

Under the influence of nitric, hydrochloric, and sulphuric acids, chlorine, etc., oil of turpentine yields many products of interest to the chemist, but as yet of little practical value.

Oil of turpentine is used to a considerable extent in medicine, although, from its disagreeable taste, and from certain bad effects which occasionally follow its use (as strangury, bloody urine, vertigo, a species of intoxication, and an eruption on the skin), it is often supplanted by less certain remedies. It is probably the most effective remedy for the expulsion of tapeworm, is nearly equally efficacious over the lumbrici or round-worms, and in the form of an injection is serviceable in the case of ascarides or thread-worms. For an adult, in the case of tapeworm or round worm, the dose should be one ounce, combined with an equal quantity of castor-oil, or made into an emulsion with yoke of egg or mucilage. In the case of children and delicate women, it is better to try a milder vermicide (see **VERMIFUGES**). In doses of from two drams to two ounces, and

in similar combination with castor-oil, it may be given as a cathartic in cases of obstinate constipation, especially when dependent on affections of the brain; in hysteria, epilepsy, tympanitis, passive hemorrhage, and in purpura hemorrhagica, in which last-named disease Dr. Neligan highly recommends it. In small doses (as from 10 to 20 minims), oil of turpentine is regarded as a diuretic; but it must be given with caution, in consequence of its stimulating properties. It is of more service in chronic mucous discharges of the genito-urinary organs, as gleet, leucorrhœa, etc., than in dropsy. In small doses, it is often useful in chronic rheumatism and in sciatica. In the Dublin school, it is much employed in small and repeated doses as a general stimulant in the low stages of continued fever. *Turpentine punch* has long been a favorite remedy in the Meath hospital (where Graves and Stokes made their reputation) in these cases. It is composed of an ounce of oil of turpentine, two ounces of brandy, eight ounces of boiling water, and a sufficient quantity of sugar. A third of this should be taken for a dose, and should be repeated if necessary every third hour. When applied externally, oil of turpentine is a speedy and powerful rubefacient and counter-irritant, and is beneficially used in this capacity in inflammatory attacks of the throat, chest, and abdomen. The best method to pursue is to rub the oil by means of a bit of flannel over the part to be acted on; over this to lay three or four folds of flannel, wrung out of hot water, and over the flannel to place a dry towel; two or three such applications produce a sufficient result. There is a *liniment of turpentine* which is powerfully stimulating, and is applied as a dressing for extensive burns; and is likewise used, with friction, in rheumatic and neuralgic cases. There is also the *liniment of turpentine and acetic acid*, which is the official representative of the well-known *St. John Long's* liniment, and is an excellent counter-irritant (applied with a sponge) in pulmonary consumption and other chronic pulmonary affections. Lastly, *ointment of turpentine*, a warm stimulating application, requires mention.

It was mentioned at the beginning of this article that on distilling turpentine with water, the oil comes over. The residue left in the retort constitutes common *resin* (or *rosin*), known also as *colophony*. See RESINS.

TURPENTINE TREE. See PISTACIA.

TURPIN, Archbishop of Rheims, friend and companion of Charlemagne, and eye-witness of the exploits he relates—such are the names and qualifications assumed by the author of a chronicle in Latin prose narrating the expedition of the Frankish emperor against the Saracens of Spain, and particularly the events that preceded and followed the battle of Roncesvalles (q.v.). That a bishop Turpin existed about this period is admitted, but the very documents in which he is mentioned, state that he was slain at Roncesvalles. There was also an archbishop Turpin of Rheims (753–800 A.D.), but he has no claim to the description given above; and, in fact, all internal evidence leads to the conclusion that it is a work of the 11th century. It seems to have sprung out of the epic ballads and traditions of the Carolingian heroes, while these were still in a comparatively pure condition; but through the legendary manner in which they are told, there is visible a monkish aim—viz., to encourage the foundation of churches and monasteries, the undertaking of religious wars against the Saracens, and above all, the pilgrimage to San Jago de Compostella. Now, as in the year 1190, a brother of the archbishop of Vienne (subsequently pope Calixtus II.) obtained by marriage the countship of Galicia; as it was from Vienne that the pseudo-Turpin's chronicle was recommended to the rest of Christendom; as the same archbishop was detected on several other occasions fabricating false documents; as subsequently, in his quality of pope, he himself pronounced the chronicle authentic in a bull of 1122 (the authenticity of which has, however, been questioned); as he pursued the same family policy in his acts as pope, and in his sermons in honor of San Jago; finally, as the chronicle of the pseudo-Turpin is very often followed in the MSS. by a dissertation of Calixtus upon the miracles of San Jago, it has seemed to critics highly probable either that pope Calixtus wrote the work himself, while yet archbishop of Rheims (*circa* 1090), or, at least, that he took an important part in its composition. The book soon acquired a great popularity, was translated into French after 1206, and was made use of by divers chroniclers, as the author or authors of the *Chroniques de Saint-Denis*, Vincentius Bellovacensis, etc. The chronicle is of great historic value, in spite of all the embellishments it has from time to time received; for, as one of the most ancient traditions of the time of Charlemagne, it has preserved numerous traits and details with more purity and fidelity than the poems of the Carolingian cycle, which are generally of later date. The chronicle has been printed in Reuberus's edition of the *Scriptores* (Hanau, 1619; Frank., 1726), but see Ciampi's *De Vita Caroli Magni et Rolandi Historia Turpino vulgo tributa* (1822), and G. Paris's *De Pseudo-Turpino* (Par. 1865).

TURPIS CAUSA, a phrase in the law of Scotland, borrowed from the Roman law, to express an immoral consideration on which some contract or obligation is founded. The rule is, that when an immoral contract is broken, no court of law will assist either party to enforce it. Thus, if a man were to let lodgings to a prostitute, with the knowledge that the lodgings were to be used for carrying on her vocation, he would have no right to bring an action to recover rent.—The same is the rule in English law.

TURQUOIS, a mineral hitherto found only in the province of Khorassan, in Persia, and much prized as an ornamental stone. It is essentially a phosphate of alumina, containing also a little oxide of iron and oxide of copper. It is harder than feldspar, but softer than quartz, and has a greenish-blue color. It is opaque, or sometimes translucent at the edges. It is sometimes called oriental turquois; while the name occidental turquois is given to a substance of similar color, found near Simon, in Languedoc, which is said to be merely bone colored with phosphate of iron.

TURRETIN, or **TURRETINI**, François, 1623-87; b. Geneva; studied theology first in his native city and afterward in Holland; pastor at Geneva, 1647; removed to Leyden, 1650; recalled to Geneva as professor of theology, 1653. His principal work, *Institutiones Theologiæ Elencticæ*, ranks high among the expositions of Calvinistic theology. His complete works were published at Geneva (1688, in 4 vols). His son, JEAN ALPHONSE, 1671-1737, b. Geneva, was professor there of ecclesiastical history, and author of several valuable works relating to his department.

TURRET-SHIP, a recent invention in naval warfare, consists of an iron-plated vessel rising but slightly above the water. In the middle of the deck are one or more turrets incased in the most massive plates, and holding each one or two guns of heavy caliber. The turret, in American vessels, is pivoted on the keel or other firm base; in English specimens it revolves on rollers under the periphery. By means of simple mechanism, it can be made either by a steam-engine or by hand, to revolve with considerable speed, thus giving the gun a range in every direction. Turret ships were first proposed in America, by Mr. Theodore R. Timby, of New York, and were patented in this country by capt. Cowper Phipps Coles of the royal navy, who, after much discussion with the admiralty, was allowed to adapt the *Royal Sovereign*, a wooden vessel which had been built for a three-decker, to his designs. The plan was tried under disadvantages, as the ship had not originally been destined for such heavy work. Notwithstanding, the *Royal Sovereign*, as a turret-ship, was declared by competent officers to be at that time the most powerful vessel in the British navy. Almost simultaneously in the United States, similar vessels, called "monitors," sprang into existence, the principal point of difference between them and the British build being that their hulls are almost entirely submerged, the turrets being wholly above the upper deck; while, in the latter, the hulls rise higher from the water, and the turrets are sunk below the deck, except in so far as is absolutely necessary for discharging the ordnance. The British model gives the advantage of higher free-board, and consequent greater safety in heavy seas. Capt. Coles lost his life in the greatest naval catastrophe of modern times, the capsizing of his great turret-ship, the *Captain*, with about 600 souls on board, in the bay of Biscay, in Sept., 1870. This vessel was built after his complete design; but naval architects attribute her loss to a low free-board, coupled with heavy masting. It has for several years been in dispute whether to trust to turret-vessels or to ships with their battery in broadside. Under the administrations of lords Palmerston and Russell, the admiralty built broadside vessels. Lord Derby's government signalized their accession to power in 1866 by immediately ordering four iron turret-ships of immense power and 4,000 tons each.

Among the advantages claimed for turret-ships are—that much heavier ordnance can be carried centrically than at broadside, with equal dislocating pressure on the keel; that in a sea the platform from which aim is to be taken is steadier at the center; that the mark offered to the enemy is smaller; and that the gunners are safer, as the turret can be turned with its port-hole away from the enemy during loading. The *Devastation*, with her 35-ton guns, has been exceeded in power by the *Inflexible*, whose armor-plating, amidships, is two ft. thick, and which is furnished with two turrets, each containing two 81-ton guns. Mr. Rendel, upon whose principle the guns are mounted, uses hydraulic power, which enables the loading and firing to be conducted by two men only.

TURRITELLIDÆ, a family of gasteropodous mollusks, having a much elongated spiral shell, the lower spires remarkably separated. The name turret-shell is often given to them.

TURTLE, the popular name of those chelonian reptiles, the family *chelonidæ* of some, which have a rather flat carapace, and fin-like paddles instead of legs, suited for swimming, and not for walking. The fore-limbs are much longer than the hind-limbs. The toes are not all furnished with nails; in some species, there is only one on each foot, in others there are two. Turtles are all marine, and although they lay their eggs on the beach, seldom visit the shore for any other purpose. They deposit their eggs in holes, which they scoop in the sand with their hind-feet. The eggs are numerous, one hundred and fifty or two hundred being often deposited at a time, and the turtle lays several times a year. The young, soon after being hatched, make their way through the sand which covers them, and immediately betake themselves to the water. The eggs are hatched by the heat of the sand alone, and the young receive no attention from their parents. Turtles crawl slowly and awkwardly on the shore; but their movements in water are comparatively quick, and even graceful. Some of the species feed entirely on grass-wrack and sea-weeds; while their powerful, hard, and sharp-edged jaws cut with great ease; others prey on crustaceans, mollusks, and fishes. Their jaws are powerful enough to crush very large shells, and the carnivorous turtles are in general more rapid in their movements than the others. The flesh of those which

subsidit on animal food is musky and unpleasant; but that of the species whose food is vegetable is much esteemed. In many tropical countries, turtles, after being captured, are kept in enclosures to which the tide has access, to be killed when they are wanted. They are capable of subsisting long without food, and are imported alive from the West Indies into Britain, to supply the tables of the wealthy. In tropical countries, turtles are often very cheap. Their eggs are a much-esteemed article of food in the countries where they are found, and are sought for by probing the sand with a light stiff cane in the places known to be frequented by turtles. Turtles are easily taken when they come ashore for the purpose of laying their eggs, and one after another may be turned on its back—in which position it is helpless, and cannot make its escape—till a sufficient number is secured. They are also, however, taken in the sea, being cautiously approached by boats when resting, or apparently sleeping, at the surface, or by divers when descried at the bottom in their feeding-grounds. A small harpoon is used, or a rope is thrown over the head of the turtle. Turtles are sometimes pursued by boats in shallow parts of the sea until they are exhausted, the clearness of the water permitting them to be seen even when they dive; and when the boat gets near enough, a man leaps overboard, and seizes the turtle, clinging with both hands to the shell. It is said that at Mozambique a species of sucking-fish (*echeneis*) is used for catching turtles, a cord being attached to the fish, which is allowed to swim away in the sea, and is sure to fasten itself firmly to the first turtle it meets.

The most esteemed turtle of the West Indies is the GREEN TURTLE (*chelonía mydas*) which is the only kind imported into Britain for aldermanic and other feasts. The green turtle attains a large size, being sometimes six or seven feet in length, and weighing 700 or 800 lbs. The plates of its carapace do not overlap one another; the central ones are almost regular hexagons. The popular name is derived not so much from the external color, which is mostly a dark olive, passing into dingy white, as from that of the fat, so much prized by epicures.—Another excellent species of turtle is the EDDLE TURTLE (*chelonía virgata*) of the East Indies, which is frequently four or five feet long.—THE HAWKBILL TURTLE (*caretta imbricata*), found in the warmer parts of the Atlantic ocean, in the Indian ocean, and in the Red sea, is particularly valuable, as yielding the best tortoise-shell (q.v.). It is one of those turtles which have the plates of the carapace imbricated, or overlapping one another like tiles. Its flesh, although not so much esteemed as that of the green turtle, is a good article of food; its eggs are also very good.—There are other turtles, having the head of a larger size, and the jaws curved toward one another at the extremity, of which one is the LOGGERHEAD TURTLE (*caouana olivacea*), a native of the warmer parts of the Atlantic, and a very rare visitant of the British seas. Others, again, have the carapace and plastron not hard, but leathery, and sometimes soft enough to yield to the pressure of the finger. One of these is the CORR-ACEOUS TURTLE (*sphargis coriacea*) of the Mediterranean and Atlantic, occasionally, but rarely, found even on the British shores. It attains a very large size, even greater than any of the species already described, but its flesh is coarse and unpleasant.

The French, encouraged by their success in pisciculture, have attempted to introduce the green turtle on the southern coasts of France. There has not yet been time to prove the success of the experiment.

TURTLE-DOVE, or **TURTLE**, *Turtur*, a genus of *columbidæ*, having the bill more slender than pigeons, the tip of the upper mandible slightly bent down. They are also more slender and elegant in form than pigeons, and generally smaller; the wings are longer and more pointed; and the tail is longer, rounded, or slightly graduated. There are numerous species, natives of warm climates. Their soft and gentle, yet loud *cooing* has attracted attention even more than their beauty, and made them a favorite subject of allusion in poetry. *T. risorius*, the most common species in Palestine, and probably the one intended in the Song of Solomon, is about ten inches in entire length, with a short tail; the general color gray tinged with red; the upper parts greenish brown, with a black collar on the back of the neck. It is often kept in confinement, and becomes very tame.—Very similar to this in size and form is the COMMON TURTLE-DOVE (*T. communis*), a native of almost all the warmer parts of the Old World, a summer visitant of the s. of Europe and of England, where it is chiefly found in the south-eastern counties. In Kent, flocks of twenty or more are often seen, particularly in the pea-fields. The tail is long and much rounded; the plumage soft, and without gloss, exhibiting finely-mingled tints of gray and brown; the crown of the head bluish; all the tail-feathers tipped with white; a black patch on each side of the neck. Other species of turtle-dove, from different parts of the world, as well as these, are not unfrequently kept in confinement, and are very gentle, if not very intelligent pets. Their cooing resounds through a whole house.

TUSCALOOSA, a co. in n.w. Alabama, containing a part of the coal field of Alabama; 1550 sq.m.; pop. '80, 24,559—24,428 of American birth, 9,675 colored. Co. seat, Tuscaloosa.

TUSCAN ORDER OF ARCHITECTURE, one of the five classic orders (q.v.), being a Roman modification of the Doric style with unfluted columns, and without triglyphs. It is the simplest of the orders.

TUSCANY, formerly a sovereign grand duchy in the w. of Italy, lying for the most part, but not wholly, s. and w. of the Apennines, in lat. $42^{\circ} 20' - 44^{\circ} 10' \text{ n.}$, and long. $10^{\circ} 15' - 12^{\circ} 20' \text{ east.}$ Area, 8,440 sq.m.; pop. in 1860, at the date of its annexation to Sardinia, 1,800,000; 1871, 1,983,810. The n. and n.e. of the country is filled with mountains, whence numerous rivers and streams flow down to the sea, the most important of which are the Arno (q.v.), the Serchio, and the Ombrone. This district is also the source of the Tiber (q.v.). The rest of Tuscany is an undulating region of hills and dales, except the coasts, which are flat and marshy. Of these marsh-lands, the largest is (or was) the *Maremma* (q.v.). The principal crops are maize, wheat, rye, and barley. Wine and oil are also abundantly produced. Mules, cattle, and sheep are reared in great numbers; there are flourishing manufactures of silks, woolens, and straw (for hats); and a very considerable trade is carried on in articles in marble, alabaster, porcelain, coral, wax, etc. Tuscany, as a *compartimento* of the kingdom of Italy, comprises the administrative provinces of Arezzo, Firenze, Grosseto, Livorno, Lucca, Massa de Carrara, Pisa, and Siena.—The ancient history of Tuscany is described at length in the article ETRURIA, and its mediæval history in the article FLORENCE. It is only necessary to add that modern Tuscany was first constituted in its present dimensions in 1569, when Cosmo de Medici became grand duke of Tuscany. On Aug. 16, 1860, the national assembly of Tuscany pronounced the deposition of the reigning dynasty; and four days later, declared for annexation to Sardinia.

TUSCARA'WAS, a co. in e. Ohio; 550 sq.m.; pop, '80, 40,197—35,909 of American birth, 146 colored. Co. seat, New Philadelphia.

TUSCARORAS, a tribe of North American Indians, who, at the settlement of North Carolina, had 15 towns on the Tar and Neuse rivers, and 1200 warriors. In 1711 they began a war with the settlers, and after a series of savage encounters, were defeated, and joined the Iroquois in New York, where they became allies of the English, and where about 50 families still reside on an Indian reservation in the western part of the state.

TUSCO'LA, a co. in e. Michigan, having Saginaw bay on the n.w.; 830 sq.m.; pop, '80, 25,739—18,786 of American birth, 106 colored. Co. seats, Vassar and Caro.

TUSCULUM, anciently a city of Latium, about 15 m. s. of Rome, was situated on a ridge of hills known as the *Colles Tusculari*, and forming part of the Alban range. We ought not to infer from its name (as Festus does, *s.v. Tuscos*) that it had any connection with the Etruscans. Mythically, it derived its origin from Telegonus and Circe; but we catch the first certain glimpse of its historical existence toward the close of the regal period at Rome. Then, however, it appears in the enjoyment of a high degree of prosperity and power, and therefore its beginnings are in all probability remote. Octavius Manilius, ruler of Tusculum, and the foremost prince in Latium, married a daughter of Tarquin the proud (see TARQUINIUS), and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. On that occasion, the Latins were so thoroughly beaten (see REGILLUS LAKE) that they were fain to enter into an alliance with the victor, and ever after—except in the single instance of the great Latin war (340–338 B.C.)—remained steady in their attachment and fidelity to Rome. As early as 378 B.C., the inhabitants of Tusculum received the Roman franchise, and among its many distinguished *gentes* may be specially mentioned the Porcian, which produced two famous men of a thoroughly "Roman" stamp, Cato *major* and Cato *minor*. Toward the close of the republic, Tusculum became a famous country residence of the wealthy Romans. Lucullus had a villa here (with parks and gardens extending northward for miles); so had Cato, Brutus, Hortensius, Crassus, Cæsar, and Cicero. The villa (*Tusculanum*, Tusculum house) of the great orator is peculiarly memorable as the place where he composed many of his philosophical works, and particularly those charming dialogues (*Tusculanæ disputationes*) which derive their name from it. Long after the western empire had fallen, Tusculum continued to flourish. As late as the 12th c., the ancient city continued entire; but in 1191 it was stormed by the Romans (between whom and the Tusculars there had long been a deadly feud), and razed to the ground. It never recovered from this blow; but lower down there arose from its ruins, if we may so speak, the town of Frascati (q.v.). Many fine remains of ancient Tusculum have been dug up in recent times, the most remarkable, perhaps, being the amphitheater, theater, and city walls.

TUSSAC GRASS, *Dactylis cæspitosa*, a large grass of the same genus with the cock's-foot grass of Britain, a native of the Falkland islands, remarkable for forming great tufts, sometimes 5 or 6 ft. in height, the long tapering leaves hanging over in graceful curves, from 5 to 8 ft. long, and an inch broad at the base. It is, however, sufficiently delicate to be very good food for horses and cattle; and the attention of British farmers having been very strongly called to it, it has been tried with success in the Hebrides, Orkney islands, and other localities in which there is a peaty soil exposed to winds loaded with sea-spray, to which it promises to be a very valuable acquisition. The inner part of the stem, a little above the root, is soft, crisp, flavored like a hazel-nut, and often eaten by the inhabitants of the Falkland islands. The young shoots are boiled and eaten as asparagus.

TUSSILAGO, a genus of plants of the natural order *compositæ*, suborder *corymbiferae*, having bractæ with a membranous edge, a naked receptacle, a hairy pappus; the florets of the ray pistilliferous, in many rows, tongue-shaped; those of the disk perfect, few. *T. farfara*, sometimes called **COLT'S-FOOT**, is the only British species. It has single-flowered scaly scapes, appearing before the leaves in early spring, the flowers yellow, both disk and ray; the leaves heart-shaped, angular, downy beneath. The leaves have a somewhat glutinous and subacid taste, and are used either by smoking, or in the form of a decoction, for relief of asthmas and troublesome coughs. They have been used with advantage in scrofula.—Nearly allied to this genus is *petasites*, of which one species, the **BUTTER BUR** (*P. vulgaris*, formerly *tussilago petasites*), is a native of Britain. The leaves resemble those of *tussilago farfara*, but are much larger; the flowers also appear before the leaves, but in a dense thyrsus, and are of a pale flesh-color. The flowers of both are much sought after by bees, as are those of *P.* (formerly *tussilago*) *alba*, *P.* (formerly *T.*) *fragrans*, natives of the s. of Europe, not uncommon in our flower-gardens.

TUSSOCK MOTH, *Larva pudibunda*, a grayish-white moth, about an inch long, the upper wings freckled, with four irregular darkish lines, the under wings nearly white. The caterpillar does great mischief in hop plantations, and is known by the name of *hop-dog*.

TUTOR, in the law of Scotland, means a guardian of the person as well as of the estate of a boy under 14, or a girl under 12; that is, while they are in a state under that of puberty. At common law, a father is both tutor and curator of his children. Tutors are divided into three kinds: tutors nominate, tutors at law, and tutors dative. A tutor nominate is he whom the father, who has the sole power of naming a tutor, has appointed by will or deed. Sometimes several are appointed to act jointly. In general, no security is required from a tutor nominate, because the father's choice implies that the tutor is a trustworthy person. Yet, if he is *vergens ad inopiam*, or of doubtful character, security will be required. Tutors at law are those whom the law will appoint in a certain order of relationship, if there is no tutor nominate. No cognate, i.e., no relation by the mother's side, will be appointed; but the nearest agnate, i.e., a person related through the father, will be appointed, if a male and of the age of 25 and able to give security. The tutor, however, has only the custody of the pupil's estate, while the custody of the pupil's person is given to the mother or nearest cognate. A tutor dative is named by the crown when there is no tutor nominate or tutor at law. Tutors other than tutors at law have the custody of both the person and estate of the pupil, and act alone for the pupil, suing for and discharging all debts due, and managing the property. The tutor's office is gratuitous, and he is not allowed to derive any profit from it, or to do acts inconsistent with his duty. For some purposes, however, such as selling the pupil's land, he must have the sanction of the court of session. He is bound, on entering office, to make up an inventory, and must keep proper accounts.

TUTTLE, DANIEL SYLVESTER, D.D., b. N. Y., 1837; graduated at Columbia college, 1857; studied theology in the general theological seminary (Protestant Episcopal); consecrated bishop of Montana, including in his jurisdiction, Idaho and Utah.

TUTTLINGEN, a t. of Württemberg, on the right bank of the Danube, 20 m. w.s.w. of Sigmaringen. It has manufactures of knives, needles, cloth, cotton, hosiery, linen, and silk, and carries on besides some trade in corn. Pop. '75, 7,515. Tuttlingen is historically notable as the scene of a battle in 1643, during the Thirty Years' war, in which an Austro-Bavarian force, under Hatzfeld and Mercy, defeated the French.

TUTTY POWDER, an impure oxide of zinc, which is found in the chimneys of the furnaces in which the ores of that metal are roasted. It has some value in medicine.

TUTUILA, an island in the Pacific, belonging to the group of the Navigators' or Samoan islands (q.v.), is about 17 m. long and 5 m. broad, and is said to contain nearly 5,000 inhabitants. The coast is bold, and the island is traversed by sharp-peaked mountains, highly picturesque in outline, and rising to from 2,500 to 3,500 feet. The harbor of Pago Pago, an ancient crater, is very deep, and completely landlocked by lofty mountains. The mountains are clothed with dense green forests, comprising the bamboo, banana, cocoa-nut tree and other palms. Between the months of November and May, fearful hurricanes break over the island, and so powerful is their effect, that they are said by the natives to *skin the land*.—*Cruise of H. M. S. Falcon*, by T. Hood (Edmonston and Douglas, Edin., 1863.)

TUYERE, the nozzle or small pipe through which the air is forced into a blast-furnace.

TVER, a government of Great Russia, bounded on the n.w. by the government of Novgorod, and on the s.e. by those of Moscow and Smolensk. Area, 25,080 sq. m.; pop. '70, 1,520,881, mostly Russians. In configuration, the government is an elevated tableland, forming part of the Valdai plateau, which throws off rivers that run n.w. into the Baltic, and s.e. into the Caspian sea respectively. The chief rivers are the Volga, with its affluents, the Tvertza, and the Mologa; the Western Dwina, the Msta, and the Tsna. Most of these rivers rise in the n.w. of the government, where there are numerous lakes. The climate is somewhat severe; the soil is not fertile, the most of the government being in marshes, and in woods and tracts of turf, the working of which, however;

is as yet insignificant. Rye and oats are the only cereals produced with success. The employments of the inhabitants are principally agricultural; but other modes of industry are gradually developing themselves, especially along the great commercial highways of the government; 50,000 men are employed in the lake-fisheries, which are important, and in the conveyance of goods.

TVER, a city of Great Russia, capital of the government of the same name, stands at the confluence of the Volga with the Tvertza, 348 m. s.e. of St. Petersburg, by the St. Petersburg and Moscow railway. The Volga, which is here wider than the Thames at London bridge, becomes first navigable for steamers at this town, although there is much difficulty in accomplishing the voyage hence to Nijni-Novgorod when the water is low. Among the important buildings of Tver are 2 monasteries, 23 churches, and 47 factories of different kinds, of which the chief is the cotton-mill of Kaoulin and Zologin, in which 1500 people find employment. Nail-making is an important branch of industry. The situation of Tver is very convenient as a landing-place, in consequence of the St. Petersburg and Moscow railway here meeting the Volga, the principal artery of the commerce of the interior of Russia. The commercial prosperity of the town is continually increasing. Cereals and iron brought from Siberia are the chief articles of commerce, and besides the articles already mentioned, linen, leather, and paper are largely manufactured. Pop. '67, 29,896.

TWEED, the most famous of Scottish rivers, rises in the extreme s. of Peeblesshire, at an elevation of 1500 ft. above sea level. It flows n.e. to near Peebles, thence e. by s. to its junction with Ettrick water, and thence in an easterly and finally north-easterly direction to its embouchure in the North sea at Berwick-on-Tweed. The river drains great part of Peeblesshire, traverses the northern districts of Selkirk and Roxburgh shires; and in its lower course it forms the boundary between Berwickshire on the n.w. and the English border-land on the s.e. It receives the Ettrick, the Teviot, and the Till from the s.; and the Gala, Leader, and Adder from the north. The Tweed passes Peebles, Innerleithen, Melrose, Dryburgh abbey, Kelso, Coldstream, and Berwick, where it falls into the sea after a course of 96 m., and having drained an area estimated at 1870 sq.m.—greater than that of any other Scottish river, except the Tay. The highest regions through which the river flows are for the most part of the nature of moors; the middle course of the river is through narrow valleys, flanked by hills, clothed with woods or in pasture; and its lower course, through wide-spread valleys, picturesque and beautiful, and through the rich plain of the Merse (see BERWICKSHIRE), has many attractions. The tide is felt at Norham castle, 10 m. from the mouth of the river; but there is little or no navigation above Berwick. Possibly the Tweed owes its fame more to the associations which connect themselves with it, than to the charms of the scenery through which it flows. Traversing the heart of the "borders," it has been witness to many a foray between the warrior-farmer n. and s. of its banks, as well as many a deadly struggle between the rival houses of the s. of Scotland; and its name is frequent in ballad and story. The Tweed is famous as a salmon and trout stream.

TWEED, WILLIAM MARCY, 1823-78; b. N. Y.; son of a chair-maker, and followed the same business, receiving slight education; entered politics while a very young man, and was an alderman in 1850, and member of congress in 1853. In 1857-59 was school commissioner of the 7th ward; became a member of the board of supervisors of the county (New York), and president of the board during four successive terms. In 1867 and 1869 served as state senator; a member of the Tammany society for many years, he became grand sachein in 1869-71. Having been appointed deputy street commissioner in 1863, when that department was changed to the department of public works, he was at its head, a position which enabled him to initiate, as is generally believed, the formation of the combination known as the "Tammany ring," though by many it is claimed that the actual leader in this movement was Peter B. Sweeney, city chamberlain. A system of "raising" the amounts of vouchers for city and county work was arranged by those who were in the "ring," and thus enormous sums were stolen, which were divided among them. The power gained by the possession and use of so much money was employed to facilitate the operations of the "ring," and to prevent its members from being brought to justice. Legislatures and judges were bribed; and bills passed and decisions rendered in their favor. Gigantic schemes of city improvement were organized and carried out successfully. Fraudulent bills were audited, and their sum divided among the thieves. No such complete plan of public spoliation was ever devised and executed before in any country. The exposure of this vast system of peculation was made through the columns of the N. Y. Times, through the intervention of a disappointed enemy of the "ring;" and Tweed was indicted in 1872 for forgery and grand larceny. Two trials were held, and he was convicted on 51 counts, and sentenced to 12 years' confinement in the penitentiary, and to pay a fine of \$12,300.18; one year for each of 12 counts in the indictment; and a fine of \$250 each for 39 other counts. He was confined on Blackwell's island from Nov., 1873, until June, 1875, when he was released by a decision of the court of appeals, on a legal technicality. He was immediately arrested on a warrant issued in a civil suit for \$6,198,957.85, and sent to Ludlow street jail. Being permitted to go out to drive with an officer, he made his escape while paying a visit to his wife in Madison avenue, and successfully fled the country and went to Spain. He was caught

and returned in Nov., 1876, and again incarcerated in Ludlow street jail until April 12, 1878, when he died.

TWEED MOUTH. See BERWICK-ON-TWEED.

TWEEDS, a name originally given to a certain kind of woolen cloth, produced in the s. of Scotland, largely made at Galashiels, Hawick, Selkirk, Jedburgh, and other places on the Tweed and its tributaries. It is prepared chiefly for men's apparel, but its use and consumption for women's wear has of late been steadily on the increase. It is of an open, soft, flexible nature; differing from English superfine cloth in not being so finely spun or closely woven, and most of all in not being so thoroughly felted. The fabric of broadcloth is not intended to show any appearance of weaving, whereas in tweeds, starting from the "shepherd's plaid," the whole art of weaving is capable of being developed in novel and fanciful designs, admitting of great variety of texture. Tweeds are further characterized by their purity of color and genuineness of make—shoddy, mungo, and cotton-warp not being yet used in the production of even the cheaper kinds. It is a manufacture of comparatively recent date. Seventy-five years ago, Galashiels, a principal seat of the manufacture, was only a small village; its few weavers individually manufacturing a species of coarse woolen cloth called "Galashiels gray," made from wool grown on the surrounding hills. About forty years later the fabric was so far improved, that its use was no longer confined to the border shepherds, but it had begun to be more or less worn by all classes in towns. The warmth, comfort, and durability of tweeds, as well as their suitability for all seasons, gradually led to their being preferred to the hard tartans, Manchester linens, and nankeens of former days; and eventually even to English doeskins. The demand for them rapidly increased. Galashiels has become a considerable town, and many large mills are now in active operation on the Tweed and its "waters," although they have for many years ceased to furnish power enough for the machinery. Nor has the manufacture confined itself to Tweedside, but has spread northward to Aberdeen, Elgin, and Inverness; and southward to Dumfries, and into Cumberland. The wools used in the production of tweeds are principally Cheviot, South American, and Danish for the coarser kinds; and Australian, New Zealand, and Saxony for the better qualities. The processes of spinning and weaving are similar to those adopted for English woolen cloth, the machinery, in fact, being, in the main, exactly the same. A great impetus was given about the year 1858, by improved wool washing and drying machinery, and especially the successful introduction of self-acting mules for the drawing and spinning of the yarns direct from carding-engine, condenser, and rovings. More recently, in order to a division of labor and capital, factories have been erected for spinning only, and others for weaving and finishing. This manufacture, now one of the great staples of Scotland, is rapidly increasing. The following figures exhibit the advance made in Scotland in the manufacture of fabrics of this class from 1851 to 1862:

	1851.	1862.
Number of factories.....	72	82
“ power-looms.....	329	1069
Sets of carding-engines.....	225	305
Value of goods made, about.....	£600,000	£1,600,000

As respects the progress made since 1862, it may be stated that, according to an estimate made in 1873, the annual value of tweeds made in Galashiels and its neighborhood amounts to about £1,500,000. The value of such goods now produced in all Scotland must therefore be nearly £3,000,000. Such has been the success of this article that it is largely imitated in the English manufacturing districts, in all qualities of material.

The jury report on the woolen goods exhibited in the international exhibition of 1862, remarks: "To the Scotch manufacturers belongs the credit of having found out what the public like, and of having led for a considerable period the public taste. So largely have their productions been imitated on the continent that many of the choicest fancy trousseings of France and other countries are easily traceable in design and coloring to their Scotch origin."

TWELFTH-DAY. See BEAN-KING'S FESTIVAL, and EPIPHANY.

TWELVE TABLES (Lat. *Lex* or *Leges Duodecim Tabularum*) the name given to the earliest code of Roman law. According to the ancient account, the code originated in this wise: In the year 462 B.C., a tribune, C. Terentilius Arsa, brought forward a proposal to appoint five men to draw up a set of laws, with the view of limiting the *imperium* of the consuls. The aristocracy, always furious, selfish, and unwise in their struggles with the commons of Rome, violently resisted this reform, and for eight years a fierce parliamentary warfare—if we may so call it—was carried on between the two orders, which ended in a sort of partial victory for the plebians; that is to say, in 454 B.C., the senate assented to a *plebiscitum* (see *PLEBISCITE*), in virtue of which three commissioners were dispatched to Greece to report on the laws in force among the different states there. After a lapse of two years they returned; and it was then agreed that ten men (*decemviri*) should be selected to draw up a code (*legibus scribundis*); but the patrician or aristocratic party took care that these *decemviri* should all be chosen from their body. The story of the political fortunes of the *decemviri* (q.v.), and of the

fate of the leading decemvir, Appius Claudius (q.v.), are well known, though we believe that it has not come down to us in a very historical dress; indeed, it is politically quite unintelligible in the main. But what concerns us here is not the political career of these men, but the character of the legislation ascribed to them. We say ascribed to them, for the whole story of the foreign travels of the commissioners, and of their eclectic procedure in the matter of the Solonian and other laws, is so completely at variance with the simple, narrow, *home-centered* feelings of the Roman people at that early time, and with the thoroughly *Italian* stamp of the legislation embodied in the "twelve tables," that it has very reasonably been doubted whether such a commission ever existed, or, if it did, whether it did not acquire its information from the Hellenic cities of lower Italy. Niebuhr, however, thinks the embassy to Greece just possible, though he is obviously reluctant to go further, and affirm that it really did occur (*Lect. Rom. Hist.*, vol. i. p. 296), and points out very clearly the difference between the Roman and Greek laws. "All," says he, "that is distinctive in the Roman law, is not to be found in the Athenian; and distinctive it is with regard to the rights of persons and things. Never had the Greeks the right of paternal authority, like the Romans; never the law, that the wife, by her marriage, entered into the relation of a daughter and co-heiress; never the *jus mancipii*, the formality in the purchase. The difference between property by formal purchase and simple property, between property and hereditary possession, does not exist in the Attic law; the Roman law of inheritance, the Roman law of debt, the Roman system in contacts of borrowing and lending, are quite foreign to the Athenians" (*Lect. Rom. Hist.*, vol. i. pp. 295, 296). These differences, and the number could easily be enlarged, have induced modern historians to adopt the theory—if, indeed, that should be called a "theory" which, in the eyes of all sound investigators, is a demonstrated fact—viz., that the twelve tables, instead of being an eclectic assortment of foreign laws, hitherto unknown to the people of Rome, and imposed on them for the first time, really expressed the first effort toward the codification of the consuetudinary law of the Latin race.

According to Livy (iii. 57) and Diodorus (xii. 56), the laws of the twelve tables were cut on bronze tablets (whence their name), and put up in a public place. Whether these tablets were destroyed by the Gauls when they sacked and burned Rome (390 B.C.) is uncertain. At all events, the later Romans entertained no doubt that the collection which existed in their time was genuine. The only portions extant are those which have been quoted by jurists and others. The twelve tables is described by Livy (iii. 34) as the *fons publici privateque juris*—the fountain of public and private law. Cicero (*de Or.* i. 43, 44) speaks of them with high praise. In the course of years, the *jus publicum*, as could not fail to be the case, was greatly changed, but the *jus privatum* of the twelve tables continued the fundamental law of the Roman state. See George Long's article "Lex," in Smith's *Dic. of Gr. and Rom. Ant.*; Niebuhr's *Lect. Rom. Hist.* (English translation, vol. i., pp. 295-319), Mommsen's *Hist. of Rome* (English translation, vol. i. book i. chap. 11, and book ii. chap. 2). The most complete essay on the history of the extant fragments of the twelve tables is to be found in Dirksen's *Übersicht der bisherigen Versuche zur Kritik, und Herstellung des Textes der Zwölf-Tafel-Fragmente* (Leip. 1824).

TWESTEN, AUGUST DETLEV CHRISTIAN, D.D., 1789-1876; studied at Kiel; professor of theology at Kiel, 1814; succeeded Schleiermacher at Berlin, whose views he had adopted, 1835; was a member of the new supreme ecclesiastical council of the united evangelical church, 1850. He published *Vorlesungen über die Dogmatik der evangelisch-lutherischen Kirche Grundriss der analytischen Logik; Matthias Flacius*, and edited Schleiermacher's *Ethik*.

TWESTEN, KARL, 1820-70; b. Kiel, Germany; son of August; educated at the universities of Berlin and Heidelberg. He was connected with the Prussian judicial services, became a leader in the progressive or liberal party, and in 1861 was elected to the chamber of deputies, and later a member of the North German *reichstag*. He was the author of *Schiller in seinem Verhältnisse zur Wissenschaft* (1863); *Machiavelli* (1868); and *Die religiösen, politischen, und socialen Ideen der Asiatischen Culturvölker und der Aegypter in ihrer historischen Entwicklung*.

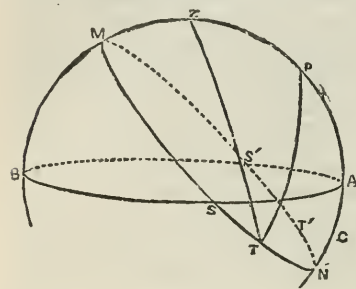
TWICKENHAM, a village in England, county of Middlesex, on the left bank of the Thames; pop. '71, 10,533. It is connected with Richmond on the opposite bank by a substantial bridge, and is 10 m. s.w. of St. Paul's, London. It contains the great church of St. Stephens, completed in 1874; the estate of Alexander Pope, where the grotto is all that remains; his monument is in the church. At a little distance is the home of Walpole, called Strawberry hill; and the Orleans house, temporarily occupied by Louis Philippe and still owned by his descendants.

TWIGGS, a co. in central Georgia, 460 sq.m.; pop. '80, 8,918—8,910 of American birth, 6,074 colored. Co. seat, Jeffersonville.

TWIGGS, DAVID EMANUEL, 1790-1862; b. Ga.; son of gen. John Twiggs, a revolutionary officer. He served in the war of 1812, rose through successive grades to brig.-gen., 1846, and commanded the right wing in the battle of Palo Alto and Resaca de la Palma in the Mexican war; brevetted maj. gen. for gallantry at Monterey, 1848; presented with a

sword by congress. In 1848 he was appointed military and civil governor of Vera Cruz; dismissed the service in 1861, for surrendering troops and munitions of war to the state of Texas, which had seceded. His brother Levi was killed at the battle of Chapultepec in 1847.

TWILIGHT. If the earth had no atmosphere, we should be involved in total darkness from the instant of sunset till the instant of sunrise. The transition from day to night and from night to day, occupies an interval which varies with the latitude and the declination of the sun, and this intermediate stage is called twilight. As long as the sun is not more than 18° below the horizon, its light is reflected by the air and the clouds and vapors suspended in it, in sufficient quantity to render even distant objects visible. The question of the duration of twilight is, therefore, simply reduced to this: How long, after sunset, or before sunrise, does the sun reach a position 18° below the horizon of a given place? And this can be answered easily by calculation in spherical trigonometry.



Thus, if Z be the zenith, P the pole of the heavens, ASB the horizon, and $MSTN$ the (small) circle which the sun describes about the pole; there is twilight while the sun moves from T to S , ZT being an arc of 108° . In the spherical triangle ZPT , we know the three sides, for ZP is the colatitude of the place, PT the sun's polar distance, and ZT is 108° . Hence we can calculate the angle ZPT , which is the sun's *hour-angle*; and from this we find at once how long before or after noon the sun passes the point T . If ZT' be also 108° , we see that it is night while the sun moves from T' to T , day while it moves from S (through M , its meridian position) to S' , morning twilight from T to S , and evening twilight from S' to T' . Make $ZC = 108^\circ$, then, if PN be less than PC , but greater than PA , there will be no point of the sun's path ($MS'NS$) so far as 108° from Z ; and therefore the points T and T' will not exist. In this case the sun will set and rise, but there will be *no night*, or, rather, twilight will occupy the whole interval from sunset to sunrise. This cannot occur in low latitudes, but does occur during certain periods of the year in northern and southern countries. For

$$PN \text{ is } 90^\circ - \text{sun's declination,} \\ PC \text{ is latitude} + 18^\circ,$$

and our condition is, therefore, that $90^\circ - \text{sun's declination}$, while greater than the latitude, does not exceed it by more than 18° . Or, in a simpler form, the latitude, together with the sun's declination, must lie between 90° and 72° . Now the sun's greatest declination is about $23^\circ 30'$, and therefore, in lat. $48^\circ 30'$ (72° to $23^\circ 30'$), there will be one night in the year (at the summer solstice) consisting wholly of twilight; for higher latitudes, more; and for lower none. Some curious problems on this subject, such as the finding the time of year at which the twilight is longest in a given latitude, were among the early triumphs of the differential calculus. A curious phenomenon, known as the *afterglow*, or second twilight, often seen in the Nubian desert, is referred by sir John Herschel to a *second* reflection of solar light in the atmosphere. Lambert and others had previously speculated on the possibility of second and even third twilights, but in their time there was no recorded observation of such appearances.

Attempts have been made to deduce from the duration of twilight the height of the earth's atmosphere; and from various measurements which have given results agreeing fairly with each other, 50 m. has been assigned as a probable value. But, till we know more of the law of temperature in the atmosphere, we have no very direct means of testing the correctness of such results. In all probability, they are too small, as, indeed, we might expect, if we suppose the higher regions of the atmosphere to be much attenuated, and, therefore, reflecting little light. Besides, the ignition of meteorites is believed to have taken place at altitudes of more than 50 m.; and auroral arches have been observed at least 60 m. high.

TWILL, a woven fabric, in which the warp is raised one thread, and depressed two or more threads for the passage of the weft: this gives the structure a curious appearance of diagonal lines.

TWISS, Sir TRAVERS, D.C.L., b. England, 1810, educated at Oxford, where he was professor of political economy, 1842-47. He was professor of international law at King's college, London, 1852-55, when he became regius professor of civil law at Oxford. He became an advocate in doctor's commons in 1840, and chancellor of the diocese of London in 1858. He was advocate-gen., 1867-72. Among his works are: *Lectures on the Science of International Law* (1856); *The Law of Nations* (1861); *Law of Nations in Times of War* (1863); and *The Black Book of the Admiralty* (1874).

TWO MOUNTAINS, a co. of s.w. Quebec, having the Ottawa river for its s. boundary; 258 sq.m.; pop. '71, 15,615. Co. seat, Sainte Scholastique.

TYBEE, an island and sound at the mouth of the Savannah river, Ga. The sound is a bay of the Atlantic, extending from Tybee island on the s. to Hilton Head on the n., opening to Port Royal entrance by Cooper's river, Wall's Cut, Lazaretto creek, and other channels. The island is 6 m. long by 3 wide; and was occupied in 1861 by gen. Sherman, who erected batteries for the reduction of fort Pulaski, which capitulated April 11, 1862.

TYBURN, previously to 1783, the chief place of execution in London, was situated near the n.e. corner of Hyde park, at the western extremity of Oxford street, and at the point where the Edgeware and Uxbridge roads unite. It took its name from a small stream which ran from Hampstead to the Thames through St. James's park, but which has long since disappeared. The gallows seems to have been a permanent erection, resting on three posts, whence the phrase "Tyburn's triple tree." Wooden galleries were erected near it for the accommodation of spectators. Hogarth's *Idle Apprentice* was executed at Tyburn; and the print which represents the scene, gives a good idea of an execution there. The criminal was conveyed all the way from Newgate to Tyburn, a distance of about 2 m., by Holborn and the Tyburn road, now Oxford street, but in the 17th c. a "sloughy country road." As Oxford street and London generally spread westward, the long procession became inconvenient, and the place of execution was, on Dec. 9, 1783, removed to the Old Bailey, or Newgate, where it has since remained.

In early times, the frequency of executions rendered the office of hangman more important than it has since become. Throughout the reign of Henry VIII. (38 years), the average number of persons executed in England was 2,000 annually. In our own time, the corresponding number has sunk to twelve. Formerly, the hangman must have had almost daily work. This fact, taken in connection with the increase of population, and the employment of the Tyburn hangman in state executions, explains the important place he occupied in popular imagination, and the frequent mention of him in contemporary literature. The first on record was "one Bull," who flourished in 1593. He was succeeded by Derrick, referred to in the *Fortunes of Nigel*, and mentioned in a political broadside as living in 1647. In the ballad of *The Penitent Tailor*, published in the same year, reference is made to his successor, Gregory Brandon—

I had been better to have lived in beggary,
Than to have fallen into the hands of Gregory.

In Gregory's time, it became the custom to prefix "squire" to the names of the Tyburn hangmen. This is said to have originated in a practical joke played upon the garter king-of-arms. He was induced to certify the authenticity of a coat-of-arms of a gentleman named Gregory Brandon, who was supposed to reside in Spain, but who turned out to be the hangman. The garter king was committed to prison for his negligence, and hence the popular error, that "an executioner who has beheaded a state prisoner becomes an esquire." Gregory was succeeded by his son Richard. "Squire Dun" followed; and after him came Jack Ketch, or squire Ketch, first mentioned in 1678. He was the executioner who beheaded lord Russell and the duke of Monmouth. Lord Macaulay, in speaking of the execution of the latter, says: "He then accosted Jack Ketch, the executioner, a wretch whose name has, during a century and a half, been vulgarly given to all who have succeeded him in his odious office. 'Here,' said the duke, 'are six guineas for you. Do not hack me, as you did my lord Russell. I have heard that you struck him three or four times. My servant will give you some gold, if you do the work well.'" —See *History of England*, vol. ii p. 205. What followed, it is needless to repeat. After this time, the "kings of Tyburn" all received the name of Ketch, and their patronymics seem to have been less noted. Jack Ketch's immediate successor was "one Rose, a butcher;" and the last of the Tyburn hangmen was Edward Dennis, condemned for taking part in the no-Popery riots, but respited, it is believed, on the ground that his services could be ill dispensed with.

Among the most memorable executions at Tyburn were those of Elizabeth Barton, the holy maid of Kent, and her confederates (1534); John Felton, the murderer of the duke of Buckingham (1628); Jack Sheppard, the highwayman (1724); Jonathan Wild, the thief catcher (1725); Mrs. Brownrigg, the murderer of an apprentice (1766); Dr. Dood (q.v.), found guilty of forging a bond for £4,200 (1777); and the rev. Henry Hackman, murderer of Miss Reay (1779). The associations connected with Tyburn have naturally led to the suppression of the name in the street nomenclature of London; but it survives in that given to the quarter of the metropolis described by Mr. Thackeray as "the elegant, the prosperous, the polite Tyburnia, the most respectable district in the habitable globe."—See Chambers's *Book of Days*, vol. ii., and *Notes and Queries*, 2d series, vol. ii.

Under a statute of William III. (10 and 11, c. 23, s. 2), prosecutors who secured a capital conviction against a criminal were exempted from all manner of parish and ward "offices within the parish in which the felony had been committed." Such persons obtained what was called a "Tyburn ticket," which was enrolled with the clerk of the peace, and sold like any other property. The privilege the tickets conferred must have been highly valued, as they sold at a high price. "Last week," says the *Stamford Mercury* of March 27, 1818, "a Tyburn ticket sold in Manchester for £280." The act under which they were granted was, however, repealed a few months later, by 58 Geo. III. c.

70, passed June 3, 1818; and since then they have ceased to be recognized.—See *Notes and Queries*, 2d series, vol. xi.

TYCOON, SHIOON, or SHOGUN, the title of the hereditary military ruler of Japan, formerly regarded as emperor. The office has been abolished since the revolution in favor of the "mikado," or spiritual ruler. The tycoon had his court at Yedo, now Tokio, and was the highest authority known to *foreigners*, though not in fact the chief ruler. The treaties which admitted foreign commerce and residents to Japan were negotiated with him.

TYE, CHRISTOPHER, an English musician of note of the 16th century. He was b. at Westminster in 1500, educated in the king's chapel, and held the office of musical instructor to Edward VI. when prince of Wales. He received the degree of musical doctor from the university of Cambridge in 1545, and from Oxford in 1548. Under Elizabeth, he was organist to the chapel royal, and produced various services and anthems, some of which are yet in repute among musicians. Dr. Tye's general scholarship was considerable.

TYLDESLEY, a well-built and increasing town of Lancashire, England. Pop. '71, 6,408.

TYLER, a co. in e. Texas, having the Neches river for its e. boundary; 930 sq.m.; pop. '80, 5,825—5,816 of American birth, 1,502 colored. Co. seat, Woodville.

TYLER, a co. in n.w. Virginia, having the Ohio river on the n.w.; 300 sq.m.; pop. '80, 11,072—10,987 of American birth, 5 colored. Co. seat, Middlebourne.

TYLER, BENNET, D.D., 1783—1858; b. Conn.; graduated Yale college, 1804; ordained pastor of Congregational church, South Britain, Conn., 1808; president of Dartmouth college, 1822—28; pastor of Second church, Portland, Me., 1828—33. Advocating the "older" theology, he was the prominent opponent of Dr. Taylor's views on the nature of sin and the government of God; and the controversy led to the formation of a theological seminary at East Windsor, of which Dr. Tyler was president and professor of theology. The fierce theological debate lingers now only in faint echoes. He published *History of the New Haven Theology*; *Memoir of Rev. Asahel Nettleton*; *Review of Day on the Will*; *Treatise on the Sufferings of Christ*; *Letters to Dr. H. Bushnell on Christian Nurture*.

TYLER, MOSES COIT, b. Conn., 1835; educated at Yale college and Andover theological seminary. He was settled over a Congregational church in Poughkeepsie, N. Y., 1860—62, when he left the ministry on account of ill-health. He lived in England 1863—67, and has since been professor of English literature in Michigan university. He has lately entered the Episcopal church. He has published the *Brownville Papers*, an edition of Morley's *English Literature*, and a valuable *History of American Literature*, of which 2 vols. have appeared. In 1881 he was appointed professor of history at Cornell university.

TYLER, ROBERT OGDEN, 1831—74; b. N. Y.; graduated West Point, 1853; commissioned in the artillery. He served on the border and as col. of volunteers through the peninsular campaign, and held important commands at Chancellorsville and Fredericksburg. In the Richmond campaign and at Spottsylvania he commanded a division of heavy artillery, and at Cold Harbor was wounded. He retired in 1865 with the brevet rank of brigadier-general.

TYLER, ROYALL, 1757—1826; b. Vt.; educated at Harvard college; read law with John Adams, and was for a time aid to gen. Lincoln, serving in Shay's rebellion. He began to practice law in Vermont in 1790, and was chief justice of the supreme court of that state, 1800—6. He published in 1809 *Reports of Cases in the Supreme Court of Vermont*. He wrote several plays, and one of them, his comedy *The Contrast*, represented in New York in 1786, was the first American play produced by a regular dramatic company.

TYLER, SAMUEL, LL.D., b. Md., 1809; son of Grafton, a tobacco planter; fitted for college with Dr. Carnahan in his seminary at Georgetown; graduated at Middlebury college, Vt.; studied law at Frederick city, Md.; admitted to the bar, 1831. In 1844 he published a *Discourse of the Baconian Philosophy*; *Burns as a Poet and as a Man* (1848); articles and essays in the *Princeton Review*, 1836—59. He was appointed professor of law in Columbia university, Washington, D. C., 1867, and was appointed to simplify the pleadings and practice in the courts of Maryland.

TYLER, WILLIAM SEYMOUR, D.D., b. Penn. 1816; educated at Amherst college. After being a teacher of the classics at Amherst academy, he graduated at Andover theological seminary and received a license to preach in 1836; but being called to the chair of Latin and Greek in Amherst college, was not ordained till 1858. In 1837 the professorship was divided and he took the chair of Greek, which he still (1881) retains. Among his numerous works are *The Germania and Agricola of Tacitus* (1847); *The Histories of Tacitus* (1848); *Plato's Apology and Crito* (1859); *Demosthenes de Corona* (1874); *The Olynthiæ and Philippics of Demosthenes* (1875); and a *History of Amherst College* (1873). His long and faithful service has given the college a high rank in his department.

TYLER INSURRECTION. A poll-tax of three groats, imposed in 1381, during Richard II.'s minority, to defray the expenses of the war with France, roused the spirit of resistance among the common people. An insult offered by one of the tax-gatherers to a blacksmith's daughter in Essex, led to the first open outbreak. The populace rose everywhere, and under the conduct of two peasants, named Wat Tyler and Jack Straw, they mustered in great force at Blackheath, committing violence on all who came into their hands. They had an interview with the king, who, finding resistance vain, promised acquiescence with their demands, which included a general pardon, freedom of commerce, and the abolition of villeinage. Meantime, a party of insurgents had broken into the Tower, and murdered the primate and chancellor, and the treasurer. The king, encountering Tyler at the head of the rioters in Smithfield, invited him to a conference, when he conducted himself with an insolence that led Walworth, the mayor, to dispatch him with a dagger. The king immediately, with great presence of mind, offered himself to head the populace, and leading them to the fields at Islington, where a body of troops had been collected for his majesty's protection, ordered the rioters to disperse. The revolt, however, was not extinguished without considerable bloodshed.

TYLER, JOHN, tenth president of the United States, b. in Charles City co., Virginia, Mar. 29, 1790. His father was an officer of the army in the revolution, and a judge of the federal court of admiralty. John entered William and Mary college at 12, and graduated at 17, was admitted to the bar at 19, and almost immediately entered upon a large practice. At 21 he was elected to the state legislature, supporting the policy of Jefferson, Madison, and the democratic party. He was almost unanimously elected five times; and in 1816, entered congress. During his long congressional career, he sustained all the measures of the state rights party. In 1835 he was elected governor of Virginia; and in 1837 senator in congress. He supported gen. Jackson and the democratic policy; but sided with Mr. Calhoun on the question of nullification. At a later period, however, 1833-34, he supported Mr. Clay's resolutions of censure on gen. Jackson for removing the government deposits from the U. S. bank. From this period, he became an active partisan of Henry Clay, the candidate of the whig or republican party; and in 1840 was elected vice-president of the United States, with gen. Harrison as president. President Harrison died April 4, 1841, a month after his inauguration, by which event Mr. Tyler became president. He began his administration by removing democrats from office, and appointing whigs, and pronouncing in favor of whig measures, but soon after vetoed a bill for a U. S. bank, passed by congress; several members of the cabinet resigned; and after some changes, John C. Calhoun, the great southern democratic statesman, became secretary of state. The most important act of his administration was the annexation of Texas, Mar. 1, 1845. At the close of his term of office, he retired to private life until 1861, when he was president of a peace convention at Washington. Failing in his efforts at a compromise, he gave his adhesion to the confederate cause, and was a member of the confederate congress until his death at Richmond, Jan. 1862.

TYLOPHORA, a genus of plants of the natural order *asclepiadaceæ*, natives of the East Indies, New Holland, etc., with a wheel-shaped corolla, and a 5-leaved fleshy coronet. *T. asthmatica*, a native of the coast of Coromandel, has a high reputation as a medicinal plant. Its root possesses properties similar to those of ipecacuanha, and has been found of great use in dysentery.

TYLOR, EDWARD BURNETT, LL.D., b. London, 1832; of a Quaker family; educated at Tottenham. He became a noted ethnologist and antiquarian, and in 1860 went to Mexico and there carried on extensive investigations of the religion, superstitions, social customs and manners of the natives, the results of which are given in *Anahuac, or Mexico and the Mexicans, Ancient and Modern* (1861). He has also written *Researches into the Early History of Mankind and Development of Civilization* (1865); and *Primitive Culture, Researches into the Development of Mythology, Philosophy, Religion, Art, and Customs*.

TYMPANUM (Lat. a drum), in anatomy, the middle ear (see EAR). In architecture, the flat space left within the sloping and horizontal cornices of the pediment of classical architecture, usually filled with sculpture (see GRECIAN ARCHITECTURE); also, the space between the arch and lintel of doorways in Gothic architecture, which is frequently enriched with sculpture.

TYNDALE, or TINDALE, WILLIAM, an eminent English reformer and martyr, well known as a translator of the Bible, was b. about 1484. He was educated first at Oxford, and afterward at Cambridge, and was, from his youth, as Foxe says, "singularly addicted to the study of the Scriptures." After leaving Cambridge, he became tutor and chaplain in the house of sir John Walsh, a knight of Gloucestershire, where he frequently engaged in religious disputes with the clerical dignitaries of the neighborhood, and soon incurred their wrath by what they deemed the heresy of his opinions. He went to London about the middle of 1523, bent upon the fulfillment of his long-cherished desire of translating the New Testament into English. Failing, however, to obtain the patronage he expected in carrying out this intention, he retired to Germany in 1524. Here his translation of the New Testament was published in 1525 or 1526, and conveyed into England. This work, although denounced by government, was yet so eagerly

received by the English, that several reprints of it were produced by the Dutch printers within the next few years. Tyndale continued on the continent, writing tracts in advocacy of the reformed doctrines; in 1530 he published a translation of the Pentateuch, and in 1531 one of the prophet Jonah. In 1533 he took up his abode in Antwerp, where, in 1534 and 1535, he published two revised editions of his New Testament. In 1535 he was treacherously arrested, and, after a confinement of 16 months, was publicly strangled and burned as a heretic at Antwerp in 1536.

Tyndale was a man of great learning as well as talent, and his own writings, in addition to his translations, show how well adapted he was for the great work of his life, so fearlessly carried out. Our modern version of the New Testament is substantially Tyndale's translation with modernized spelling. See *William Tyndale*, by rev. R. De-maus, M.A. (1871).

TYNDALL, JOHN, physicist, was b. Aug. 21, 1820, at Leighlin Bridge, county Carlow. He had few educational advantages. On returning from the continent, where he received part of his education, he found employment in one of the subordinate grades of the ordnance survey. He was afterward appointed teacher of natural philosophy at Queenwood college, Stockbridge, and there commenced those original investigations which have distinguished him among the explorers of science.

In Jan., 1853, Tyndall communicated his first paper to the royal society, *On Molecular Influences—Transmission of Heat through Organic Structures*. It exhibits much of that skill in experimenting and fertility of resource which characterize his subsequent researches, and illustrates certain important questions in natural philosophy.

Year by year from the date above mentioned, Tyndall has extended our knowledge of science. His field of research is wide and varied, as exemplified by the subjects of his papers published in the *Philosophical Transactions*—*On the Vibrations and Tones produced by the Contact of Bodies having Different Temperatures* (1854); *On the Physical Phenomena of Glaciers* (1857); *On some Physical Properties of Ice* (1858–59); *On Transmission of Heat through Gaseous Bodies* (1859); a series on *Radiation*, six papers (1861–65); *On Calorescence* (1865); *On the Invisible Radiation of the Electric Light* (1865). During the year 1867, he lectured on *Sound and Sensitive Flames*.

In 1855, and again in 1861, Tyndall was appointed to deliver the Bakerian lecture to the royal society: the subjects were: *On the Nature of the Force by which Bodies are repelled from the Poles of a Magnet*; and *On the Absorption and Radiation of Heat by Gases and Vapors, and on the Physical Connection of Radiation, Absorption, and Conduction*, the latter being one of the series on *Radiation* above mentioned. The publication of this series of papers marks a period in the history of scientific research, for the facts therein set forth, and the conclusions drawn from them, demonstrate the relation of aqueous vapor to radiant heat, and elucidate certain meteorological phenomena which connect themselves with some of the profoundest and most interesting questions of cosmical science.

In 1864 the council of the royal society awarded to Tyndall their Rumford medal, in recognition of his scientific researches, particularly as bearing on light and heat. As a lecturer on scientific subjects, Tyndall enjoys a high reputation. His lectures at the royal institution and the school of mines have been marked by fullness of knowledge and clearness of illustration. Tyndall has experimented and written on the subject of germs, and on the acoustic transparency or cloudiness of the atmosphere.

In 1852, Tyndall was elected a fellow of the royal society. In 1853 he was appointed professor of natural philosophy in the royal institution, where, as successor to Davy and Faraday, he sustains the reputation of the place for original scientific research. His lectures at the school of mines have been attended by crowds of workmen. He is LL.D. of Cambridge, and is a member of a number of the scientific societies of the continent. He was chosen president of the British association in 1874. Besides his papers for the royal society, Tyndall has written articles in the *Philosophical Magazine* and *The Fortnightly Review*. His separate works comprise: *The Glaciers of the Alps, being a Narrative of Excursions and Events* (1860); *Mountaineering* in 1861 (1862); *Heat considered as a Mode of Motion* (2d ed., 1865); *Radiation*, being the Rede lecture, delivered at Cambridge in 1865; *Lectures on Sound* (1867); a memoir of prof. Faraday (1868); *Fragments of Science, and Hours of Exercise in the Alps* (1871); *Six Lectures on Light* (1873); and *Address delivered before the British Association in 1874, with Additions* (1874). In 1876, Tyndall was married to a daughter of lord Claud Hamilton.

TYNE, a river in the north of England, important from the enormously valuable mineral district through which it flows, and for the flourishing towns that line its banks, is formed by the confluence of two head-waters—the north Tyne and the south Tyne. The north Tyne rises on the Scottish border, 11 m. s.e. of Hawick. It flows s. across Keelder Moor, and s.e. to Hexham, after traversing a district abounding in picturesque villages and gentlemen's seats. Its chief affluent is the Reed, which rises on Carter Fell, and flows s.e. past Otterburn to Bellingham, where it joins the larger stream. Near Hexham, the north Tyne is joined by the south Tyne, which rises on the slopes of Cross Fell, 11 m. n. of Appleby, in Westmoreland, flows n. to Haltwhistle, and thence e. to Hexham, through a district crowded with old castles and peel-houses. From the junction of the two head-waters, the Tyne flows e. through the south of Northumberland,

which presents charming scenery, and is studded with castles and country seats. At Blaydon—about 8 m. above Newcastle—the navigation begins, and from this point, passing Newcastle (q.v.), Gates-head (q.v.), North Shields (q.v.), and South Shields (q.v.), its banks are lined with foundries, furnaces, docks, wharves, and quays. Total length, 80 miles. For the navigation of the river, see the chief towns near its mouth.

TYNEMOUTH, a small village and parish of Northumberland, takes its name from the river Tyne, on the north bank of which, and near its mouth it stands. It is 8 m. e. of Newcastle by railway, and its light-house is in lat. 55° 1' n., long. 1° 25' west. Though itself only a village, it gives name to a township containing (1871) 21,968 inhabitants. Much of this township, however, is comprised in the town of North Shields (see SHIELDS, NORTH), and counts in the population of that town. It also gives name to a parliamentary and municipal borough, containing (1871) 38,960; but including besides the village of Tynemouth, the large town of North Shields, and the three villages of Chirton, Preston, and Cullercoats. The village of Tynemouth is much frequented as a watering-place by the inhabitants of Newcastle. Its sands, about a mile in length, form an excellent bathing-ground. There are many attractive buildings and institutions, as the castle and fortifications, the fine ruins of a priory and lady chapel, the master mariners' asylum, etc. The borough of Tynemouth sends one member to the house of commons.

TYNG, STEPHEN HIGGINSON, D.D., b. Mass., 1800; graduated, Harvard college, 1817; engaged in mercantile pursuits for 2 years; studied theology, and was ordained a minister of the Protestant Episcopal church, 1821; preached at Georgetown, D. C., 1821-23; at Queen Anne's parish, Prince George's co., Md., 1823-29; rector of St. Paul's church, Philadelphia, 1829; of the church of the Epiphany, 1833; of St. George's church, New York, 1845, which charge he resigned in 1879, having had for the 2 or 3 years previous the rev. Dr. Williams as colleague. He has been a leading opponent of ritualism. He has been widely noted for fervid eloquence as a preacher, and has zealously advocated the temperance and other reforms. He has published *Lectures on the Law and the Gospel*; *The Israel of God*; *Christ is All*; *Christian Titles*; *Recollections of England*; *Sermons preached in the Church of the Epiphany*; *Family Commentary on the Four Gospels*; *Bible Companion*; *Forty Years' Experience in Sunday-Schools*; *The Spencers*; *The Prayer-Book Illustrated by Scripture*; *The Feast Enjoyed*. He edited the *Episcopal Recorder*; *Protestant Churchman*; *Theological Repository*.

TYNG, STEPHEN HIGGINSON, JR., D.D., b. Philadelphia, 1839; graduated, Williams college, 1858; studied theology at the Virginia Episcopal seminary; ordained 1861; was assistant to his father in St. George's church for 2 years; rector of the church of the Mediator, New York, 1863; chaplain to the 12th New York volunteers, 1864; rector of the church of the Holy Trinity, New York, which he organized, 1865; resigning on account of impaired health in 1881, and has accepted the agency for the Equitable life insurance company in Paris. He edited for several years, *The Working Church*, a weekly journal. He has shown rare gifts in the organization of various benevolent instrumentalities in connection with his church, which have accomplished an immense work of good.

TYPE, in theology, an image or representation of some object which is called the antitype. In theological use it is applied chiefly, although not exclusively, to those prophetic prefigurings of the persons and things of the new dispensation which are found in the ritual, and even in the history of the Old Testament. Under the heads HERMENEUTICS, EXEGESIS, have been explained the different senses of which the literal text of Scripture is considered susceptible. Of one of these, the "mystical," the "typical" sense forms a further subdivision. The word "type" itself is used as well by the writers of the New Testament (Acts, vii. 43; Romans, v. 14; Philippians, iii. 17) as by the Jewish historians, for instance, Philo, *Opp.* t. i. p. 168; and while St. Paul and other sacred writers speak of the ancient types of things to come, St. Peter completes the parallelism by describing baptism as the antitype of the ark of Noah, 1 Peter, iii. 21. Of the types of the Old Testament, many are directly pointed out as such in their very institution; many also are distinctly applied in the New Testament. There is a large class, however, which more properly fall under the mystical sense of Scripture, and which are called indirect, that is to say, "adaptive" or "applied" types. In the application and interpretation of these, many of the fathers, and especially Augustine and Gregory the great, are most elaborate and ingenious.

TYPE (Gr. *typos*, an impression or stamp), the name given to the stamps or dies which impress the letters on the paper in printing (q.v.). Printers, in early times, made the letters which they used, but in process of time the necessity for a division of labor created the distinct business of *type-founding*. There is evidence that, at the beginning of the 16th c., the apparatus for type-founding was much the same as up till near the middle of this century. The first step in the process is the cutting of a punch or die resembling the required letter. The punch is of hardened steel, with the figure of the letter cut, the reverse way, upon its point. On this die being finished, it is struck into a piece of copper about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper, being so impressed with the representation of the letter, requires to be adjusted to the mold, so that the "face" or impression of the punch (in the copper) may be brought into such relation with the metal which forms the

"body" or stalk of the type, that when the types are "set up" they may stand at the proper distance from each other, and be in "line" or range, and also square to the page; this work is termed "justifying," and the copper is now a "matrix." The matrix is now fixed into a small instrument or frame, called the mold, which is composed of two parts. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter, and is made exceedingly true. The melted metal, being poured into this space, sinks down to the bottom in the matrix, and, instantly cooling, the mold is opened, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. In casting types, the founder stands at a table, and has beside him a small furnace and pot with heated metal, which he lifts with a small ladle. *Type-metal* was a compound of lead and regulus and antimony, with a small proportion of tin; but in 1856 a new compound was formed by adding a *large* proportion of tin to the lead and antimony, which considerably increased the cost of the metal, but it doubled its durability. The antimony gives hardness and sharpness of edge to the composition, while the tin gives toughness and tenacity, and removes the brittleness which antimony causes when used largely without tin.

Various attempts were made during the early part of this century to cast type by machinery; but the first successful apparatus for this purpose was the invention of Elihu White of New York, which was modified and repeatedly improved upon by David Bruce, a Scotchman resident in America. The type-casting machine was introduced into Great Britain, and patented by Miller & Richard, of Edinburgh, in 1848. This machine, which requires a man to drive it, produces more than double the quantity that the hand-mold did, while the finish and regularity of the type so cast are much more perfect. Another machine was constructed and patented some years after by the same firm, with the view to apply steam for driving, which was successfully completed in 1860, and is now the most advanced and approved system of casting.

The type-casting machine consists, first, of a small melting-pot, which contains the molten metal, and is placed over a small furnace having an outer case of cast-iron. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed, and thus securing the full force exerted upon the piston being transmitted by the piston to the molten metal under it, and forcing it through a narrow channel leading from the bottom of the chamber in which the piston works to the outside of the pot, where a nipple is inserted, with a small hole through it, communicating with this narrow channel. Against this nipple, the mold in which the type is formed is pressed at the moment at which the piston descends, and so receives the molten metal that forms the type.

The second part of the machine is that which carries the mold, and to which the mold is firmly bolted. The mold is similar to the old hand-mold, but modified to suit the machine; it is much stronger; the "jets" are shorter, and the orifice by which the metal enters is smaller, so that it may be brought exactly coincident with the small hole in the nipple in front of the pot. The mold—as the old hand-mold—is made in halves; the one-half being firmly bolted to an arm which, by cams and levers, is made to oscillate, and carry the mold to and from the nipple in front of, and above the pot; the other half of the mold is bolted to another arm, which, by a peculiarly formed hinge, is attached to the first arm, so that the two halves of the mold may be made to open and shut upon each other like the lid of a snuff-box; and so both sides of the mold oscillate together to and from the nipple in the pot from which they receive the molten metal. The furnace, with the pot and machine carrying the mold, are raised upon cast-iron framing to a height convenient for a man standing to watch the working of the machine. The operation of the machine is as follows: The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mold is brought against the nipple; the valve closes to prevent the metal being forced back into the pot; the piston descends, and forces the metal through the narrow channel into the mold; the mold then recedes from the nipple, and in receding the two halves separate from each other and eject the type; the mold again approaches the nipple, and in approaching the two halves close together, and are ready for another operation.

A blast of cold air is directed upon each mold to keep it cool.

When the type is cast from the mold it is in a rough state, and as soon as a heap has accumulated on the caster's table they are removed by a boy, who breaks off a superfluous tag of metal, or "jet," hanging at the end of each type. From the breaking-off boy the types are removed to another place, where a boy rubs or smoothes their sides upon a stone. Being now well smoothed, they are next removed to a table and set up in long lines upon a "stick;" they are then dressed or finished, and, after being examined by a magnifying-glass, are ready for use. Whatever be the size of the types, they are all made of a uniform height, and must be perfectly true in their angles, otherwise it would be quite impossible to lock them together. A single irregular type would derange a whole page. The height of type made in this country is $\frac{2}{3}$ of an inch; those made in France, Spain, and Germany are higher. All the types of one class of any founder are always uniform in size and height, and, to preserve their individuality, all the letters, points,

etc., belonging to one class, are distinguished by one or more notches or nicks on the body of the type, which range evenly when the types are set. These nicks, as we shall immediately see, are also exceedingly useful in guiding the hand of the compositor. Types are likewise all equally grooved in the bottom, to make them stand steadily.

The earliest types used were in the style known as Gothic or black-letter; which was afterward superseded, except in Germany, by the Roman letter. See BLACK-LETTER. The varieties of size of types in the present day amount to 40 or 50, enlarging by a progressive scale, from the minutest used in printing pocket-Bibles, to the largest which is seen in posting-bills on the streets. Printers have a distinct name for each size of letter, and use about 16 sizes in different descriptions of book-work; the smallest is called *brilliant*, the next *diamond*, and then follow in gradation upward, *pearl*, *ruby*, *nonpareil*, *emerald*, *minion*, *brevier* (the type with which this sheet is printed), *bourgeois*, *long primer*, *small pica*, *pica*, *English*, *great primer*, and *double pica*. The larger sizes generally take their names thus—*two-line pica*, *two-line English*, *four*, *six*, *eight*, or *ten line pica*, etc. Other nations designate many of these sizes by different names. Some of these names were given from the first maker; others from the books first printed with the particular letter. Thus, *Cicero* is the name of a type in France and Germany, with which Cicero's letters were first printed (Rome, 1467); *pica* is from the service of the mass, termed *pica* or *pie*; *primer*, from *Primarius*, the book of prayers to the Virgin; *brevier*, from *breviary*; *canon*, from the *canons* of the church, etc.

All kinds of types are sold by weight by the founders, the price varying in amount according to the size of the letter. The smallest size, *brilliant*, costs about 10s. per lb.; *diamond*, about 6s. per lb.; *brevier*, about 1s. 6d. per lb.; *English*, 1s.; and so on in proportion for all intermediate sizes. Expensive as types thus are, their prices will not appear too high, considering the immense outlay in cutting the punches and the general manufacture. In the *diamond* size, 2,800 go to a single pound-weight of the letter *i*, and of the thinnest *space* about 5,000.

A complete assortment of types is called a *font*, which may be regulated to any extent. Every type-founder has a scale showing the proportional quantity of each letter required for a font; and a peculiar scale is required for every language. For the English language, the following is the type-founder's scale for the small letters of a font of types of a particular size and weight:

a	5500	f	2500	k	800	o	8000	s	8000	w	2000
b	1600	g	1700	l	4000	p	1700	t	9000	x	400
c	3000	h	6400	m	3000	q	500	u	3400	y	2000
d	4400	i	8000	n	8000	r	6500	v	1200	z	200
e	12,000	j	400								

It will be seen from this scale that the letter *e* is used much more frequently than any other character.

Type-founding originated in Germany along with printing; as early as 1452, P. Schöffer (see GUTTENBERG) had substituted types of cast-metal for the original wooden types. The earliest and best punch-cutters were in Nürnberg, which continued for a considerable time to supply the type-founders throughout Germany with punches. Bodoni (b. 1740, d. 1813) in Italy, the Didots (q.v.) in France, and Breitkopf (b. 1719, d. 1794) in Leipsic, are the most distinguished names in the subsequent history of type-making on the continent. The art made little progress in Great Britain from the time of Caxton, and the types used were mostly imported from Holland, until about the year 1720, when William Caslon, originally an engraver of ornamental devices, turned his attention to letter-cutting, and soon established such a reputation as to not only put a stop to the importation of foreign types, but caused his own to be frequently sent to continental countries. The foundry established by Caslon in London is still in existence. Baskerville (q.v.) is the next greatest name in the history of the art in England. The types produced by Alexander Wilson of Glasgow became the foundation of the fame of the Foulis (q.v.) as printers. The type-foundry of Miller and Richard in Edinburgh has enjoyed a well-merited reputation for a half century and more.

The large letters used in posting and hand bills were formerly manufactured chiefly in London and Sheffield, but are made now also in Edinburgh. In this kind of types very great improvements have also been made in recent times; and the varieties are becoming yearly more numerous and ornamental in character. The letter used in printing in North America is made principally at New York; and the style of both typography and press-work in that country is rapidly improving.

Type-setting, or "Composing."—All the types used in printing offices are sorted in cases, or shallow boxes, with divisions. There are two kinds of cases—the *upper* and *lower case*; the latter lying nearest the compositor upon the frame for their support. The lower case is placed immediately under his hand, the upper case directly above in a slanting position, and the under part of the frame is stocked with cases of different fonts. In the upper case are placed all the capitals, small capitals, accented letters, a few of the points, and characters used as references to notes. In the lower case lie all the small letters, figures, the remainder of the points, and spaces to place between the words. In the lower, no alphabetical arrangement is preserved; each letter has a larger or a smaller box allotted to it, according as it is more or less frequently required; and all those letters most in request are placed at the nearest convenient distance to the compositor. By this ingenious and irregular division of the lower case much time is

saved to the compositor, who requires no label to direct him to the spot where lies the particular letter he wants. To a stranger nothing appears so remarkable as the rapidity with which a compositor does his work; but habit very soon leads the hand rapidly and mechanically to the letter required. When *italic* letters have to be introduced, they are taken from a separate pair of cases of the same font.

The process of composing and forming types into pages may now be adverted to. Placing the copy or manuscript before him on the upper case, and standing in front of the lower case, the compositor holds in his left hand what is termed a composing-stick. Sometimes this instrument is of wood, with a certain space cut in it of a particular width; but more commonly it is made of iron or brass, with a movable slide, which, by means of a screw, may be regulated to any width of line. In either case, the composing-stick is made perfectly true and square. One by one, the compositor lifts and puts the letters of each word and sentence, and the appropriate points, into his stick, securing each with the thumb of his left hand, and placing them side by side from left to right along the line. When he places a letter in the stick he does not require to look whether he is placing it with the face in its proper position; his object is accomplished by looking at what is called the *nick*, which must be placed outward in his composing-stick. This is one of those beautiful, and at the same time simple, contrivances for saving labor which experience has introduced into every art, and which are as valuable for diminishing the cost of production as the more elaborate inventions of machinery. When he arrives at the end of his line, the compositor has a task to perform in which the carefulness of the workman is greatly exhibited. The first letter and the last must be at the extremities of the line: there must be no large spaces left in some instances, and crowding in others, as we see in the best manuscript. Each metal type is of a constant thickness, as far as regards that particular size of letter; though all the letters are not of the same thickness. The adjustments, therefore, to complete the line with a word, or at any rate with a syllable, must be made by varying the thickness of the spaces between the words. A good compositor's work is distinguished by uniformity of spacing; he will not allow the words to be very close together in some instances, and with a large gap between them in others, as is evident, for instance, in this sentence. In composing poetry, or similar matter, where there is always a blank space at one of the ends of the line, spacing is very easily accomplished by filling up the blank with larger spaces, or *quadrats*. But whether prose or poetry, the matter of each line must be equally adjusted and *justified*, so as to correspond in point of compactness with the previously set lines. The process of composing is greatly facilitated by the compositor using a thin slip of brass called a *setting-rule*, which he places in the composing-stick when he begins, and which, on a line being completed, he pulls out, and places upon the front of the line so completed, in order that the types he sets may not come in contact with the types behind them, but glide smoothly into their places to the bottom of the composing-stick.

When the workman has set up as many lines as his composing-stick will conveniently hold, he lifts them out by grasping them with the fingers of each hand, and thus taking them up as if they were a solid piece of metal. He then places the mass in an elongated board, termed a *galley*, which has a ledge on one or perhaps both sides. The facility with which some compositors can lift what is called a *handful* of movable type without deranging a single letter, is very remarkable. This sort of skill can only be attained by practice; and one of the severest mortifications which the printer's apprentice has to endure is to toil for an hour in picking up about a thousand letters, and then see the fabric destroyed by his own unskillfulness, leaving him to mourn over his heap of broken type, technically denominated *pie*.

Letter by letter, and word by word, is the composing-stick filled; and by the same progression the galley is filled by the contents of successive sticks. When the compositor has set up as many lines as fill a page he binds them tightly round with cord, and removes them from the galley.

Sometimes, as in the case of newspaper and similar work, the *handfuls* of type are accumulated till they fill the galley, and in that form are prepared for press. After the matter is thus far prepared, it is the duty of the press-man to take an impression or *first proof* from the types, in order that the first-proof *reader* may compare with "copy," or MS.; after which it is handed to the compositor, so that he may correct the errors which are sure to have been made. Proofs are usually taken by a press kept for the purpose. After the galley matter is corrected and re-corrected by the compositor, it is divided into pages of the size wanted; and head-lines and figures indicating the number of the page being added, the pages are arranged upon a large firm table, and there securely fixed up in an iron frame or *chase*, by means of slips of wood and wedges, or *quoins*.

This process, which is called *imposing*, being completed, and the face of the types being leveled by a *planer* and mallet, the *form*, as it is called, is proved, and prepared for press. Proof-sheets being taken, they are subjected to the scrutiny of a *reader* employed in this peculiar function in the office, the author himself having previously given effect to his corrections or emendations. When the *reader* has pointed out words and letters to be altered or corrected, the compositor once more goes over the form, correcting the errors by lifting out the letters with a bodkin, and, when revised, the sheet is pronounced ready for printing. The imposing-table at which all these corrections are made is usually composed of smooth stone, or marble, or cast-iron on the top, and requires to be a substantial fabric. See TYPE-SETTING MACHINES.

TYPE-SETTING MACHINES. The first type-composing machine on the records of the English patent office appears to be that of Mr. W. Church, and the specification of his patent is dated Mar., 1822. This, after a lapse of 20 years, was followed by a number of others, scarcely a year passing without one or more being made the subject of a patent. Moreover, some of them, among others those of Young and Delcambre, were for a long time before the public. For at least half a century, therefore, the construction of a useful type-setting machine has been a problem which a number of ingenious men have tried to solve, but it is only within the last year or two that there has been anything more than the mere appearance of success. If the reader will look carefully at a page of printed matter, he will notice that the spaces between the words are not equal, and he will easily understand that to reduce this inequality to a minimum, requires skill and experience if the work is to go on swiftly. It is in the doing of this, which is called "justifying," where a machine fails, because another operator must afterward space the machine-setting into lines of equal length. It is comparatively easy to construct a machine which will, by some mechanical arrangement, drop any required letter from a series of files or reservoirs of types, through a channel which conveys it to a composing-stick—that is, which will set up type, in any required order, but with *exactly equal spaces* between the words; but the difficulty of justifying has not yet been got over. Still, as that operation can be performed by girls at comparatively little cost, there is a decided advantage in favor of the machine.

In the early composing-machine by Church, "the types are arranged in files in a case at the top, each file being directly over a slit in a horizontal frame. One of a number of jacks protrudes through each of these slits, each jack being connected with a key in a manner somewhat similar to the jacks and keys of a harpsichord." On the depressing of any particular key, the undermost type of the file is pushed into a race, from which it passes to a composing-stick. It is surprising how closely this description conveys to us the leading idea in most of the type-composing machines invented since 1822. Hattersley's machine, for example, which was patented in 1857, has somewhat analogous movements, but the keys are arranged more like those of a *concertina*, and the details are different. This machine, which occupies a space of about 2 feet by 3, has a horizontal top stage on which is placed a partitioned tray, containing the rows of types running from back to front, each row being of course all the same letter. Descending vertically along the front of this tray is a series of as many wires with pistons as there are rows of types, and these pistons are depressed by the keys acting by bell-cranks, and then return to their first position by means of india-rubber bands or springs. A propeller kept in a state of tension by an india-rubber string is placed in the rear of each row of types, and draws them forward to the piston. When the girl working the machine presses down, say an *e* key, it depresses the *e* piston, which pulls down with it an *e* type, and drops it into a tube or channel which conveys it to what represents the composing-stick, and so on with every other letter, figure, comma, or "space." The series of channels converge to a focus or common outlet, through which every type in succession passes to its proper place. Machines on Hattersley's principle, with the details much improved by Mr. Fraser of Edinburgh, are at present in use by a large printing firm there. With one of these machines a girl can compose from "copy" at the rate of from 10,000 to 12,000 types per hour, but this rate can hardly be maintained continuously, the strain of such rapid setting being too great for the operator. The types are set in long lines, and require afterward to be "justified." This is done by another girl, who, with the aid of a slip of brass of the desired length of line, forms the matter into pages, spacing out each line as she proceeds.

The want of an efficient distributing machine has hitherto been the great drawback to the adoption of compositors, but Mr. Fraser has met this difficulty by constructing a distributor which bids fair to supply the want. It separates the different letters by a series of switches acted upon by keys similar to those of the composing-machine. On the depression of a key, the corresponding switch is opened, and the type guided to its proper compartment in the composing-machine reservoir. Type-setting and distributing machines, like the above in their plan of working, have been in operation for several years in the *Times* office, one of which was exhibited at South Kensington in 1872. Another composing-machine, by Mr. Mackie, of Warrington, deserves notice for the ingenuity shown in its construction. It is much more elaborate than any of those above referred to. The first operation is to perforate slips of stiff paper, which is done by a separate machine. These slips, when perforated, represent the words to be composed, and are then passed to the composing-machine proper. In it the types are placed by hand in a series of boxes above the circumference of a large wheel, which is made to revolve, and at each revolution a certain part, acting in concert with the previously perforated paper, comes in contact with mechanism which releases the desired types at the proper time, and carries them forward to a point, where they are pushed off into lines in the composing-stick.

TYPE-WRITERS, machines for printing with movable type. The first patent in the United States for a practical machine of the kind was issued in 1863. The types were arranged in parallel rows, and the impression given by a striker or plunger, the operator having but to depress keys, arranged with reference to rapidity of motion, in the necessary order. In other type-writers the printing types are placed on the periphery

of a wheel, and brought to the printing point by revolution. In most varieties the types are at the end of levers, so arranged as to strike at a common printing point, and the paper is passed under that point by ordinary clock-work machinery.

TYPES, CHEMICAL. The idea of referring organic bodies to some simple type or representative, has attracted the attention of many chemists, among whom Dumas, Sterry Hunt, Laurent, and Gerhardt, especially deserve notice. As our limited space prevents us from attempting to trace out the history of the theory, we shall confine ourselves to a statement of the outline of the doctrine as laid down by Gerhardt, and now adopted in most recent books on organic chemistry. The four principal types, to which most of the chemical compounds are referred, are the following: (1) The hydrogen or metallic type, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$; (2) The hydrochloric acid or chloride type, $\begin{smallmatrix} \text{H} \\ \text{Cl} \end{smallmatrix} \}$; (3) The water or

oxide type, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \} \text{O}_2$; and (4) The ammonia or nitride type, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \} \text{N}$. The reason why the

equivalents of the hydrogen in the hydrogen type, and of the water in the water type, are doubled, is as follows: an accurate study of the volumetric relations of nearly all organic compounds, shows that their molecules furnish equal volumes of vapor, and that the gaseous volume occupied by each molecule will occupy 4 volumes, if oxygen represent the unit of volume. Taking the volume of oxygen, O, as 1, those of hydrogen, H, and of water, HO, are, as is well known, 2. Hence, to fix the standard of comparison at 4 volumes of oxygen, we must write H_2 or $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$, or H_2O_2 , or $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \} \text{O}_2$, instead of the apparently simpler forms, H and HO. In the other cases, this modification is unnecessary, as the gaseous volumes of hydrochloric acid (HCl) and ammonia (NH_3) are in accordance with the general laws, and are equal to 4 standard volumes.

1. The *hydrogen type*, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$, includes, according to Gerhardt, the radicals of the alcohols, marsh gas, and the hydrocarbons homologous with it, the aldehyds, etc. Thus, marsh gas (or hydride of methyl), C_4H_4 , is written $\begin{smallmatrix} \text{C}_4\text{H}_3 \\ \text{H} \end{smallmatrix} \}$, according to the type theory, and aldehyd (hydride of acetyl), $\text{C}_4\text{H}_4\text{O}_2$, is written $\begin{smallmatrix} \text{C}_4\text{H}_3\text{O}_2 \\ \text{H} \end{smallmatrix} \}$; or both the upper and lower equivalent of hydrogen in the typical formula may be repeated. Thus, acetone or methylide of acetyl, $\text{C}_6\text{H}_6\text{O}_2 = \begin{smallmatrix} \text{C}_4\text{H}_3\text{O}_2 \\ \text{C}_2\text{H}_3 \end{smallmatrix} \}$. Among the compounds of inorganic chemistry belonging to this type, Gerhardt places the hydrides, arsenides, and antemonides of the metals.

2. The *hydrochloric acid type*, $\begin{smallmatrix} \text{H} \\ \text{Cl} \end{smallmatrix} \}$, is removed by many chemists from the primary or principal types, and is regarded as a derived type from the preceding one, one equivalent of H being here replaced by one of chlorine. It includes the chlorides, fluorides, iodides, bromines, cyanides, the ethers of the hydracids, etc. As examples, we may take chloride of benzoyl, $\text{C}_{14}\text{H}_5\text{O}_2\text{Cl} = \begin{smallmatrix} \text{C}_{14}\text{H}_5\text{O}_2 \\ \text{Cl} \end{smallmatrix} \}$, hydrochloric ether, $\text{C}_4\text{H}_5\text{Cl} = \begin{smallmatrix} \text{C}_4\text{H}_5 \\ \text{Cl} \end{smallmatrix} \}$, and iodide of ethyl, $\text{C}_4\text{H}_5\text{I} = \begin{smallmatrix} \text{C}_4\text{H}_5 \\ \text{I} \end{smallmatrix} \}$.

3. The *water type*, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \} \text{O}_2$, includes the oxides (in which term are embraced acids, bases, and salts), the sulphides, the alcohols, the simple and compound ethers, the monobasic organic acids, etc. The following are a few examples: methyl alcohol or wood-spirit, $\text{C}_2\text{H}_4\text{O}_2 = \begin{smallmatrix} \text{C}_2\text{H}_3 \\ \text{H} \end{smallmatrix} \} \text{O}_2$; common alcohol, $\text{C}_4\text{H}_6\text{O}_2 = \begin{smallmatrix} \text{C}_4\text{H}_5 \\ \text{H} \end{smallmatrix} \} \text{O}_2$; acetic acid, $\text{C}_4\text{H}_4\text{O}_4 = \begin{smallmatrix} \text{C}_4\text{H}_3\text{O}_2 \\ \text{H} \end{smallmatrix} \} \text{O}_2$; acetate of potash, $\text{KO}, \text{C}_4\text{H}_3\text{O}_3 = \begin{smallmatrix} \text{C}_4\text{H}_3\text{O}_2 \\ \text{K} \end{smallmatrix} \} \text{O}_2$; acetic ether, $\text{C}_4\text{H}_5\text{O}, \text{C}_4\text{H}_3\text{O}_3 = \begin{smallmatrix} \text{C}_4\text{H}_3\text{O}_2 \\ \text{C}_4\text{H}_5 \end{smallmatrix} \} \text{O}_2$; common ether ($\text{C}_4\text{H}_5\text{O}$) $_2 = \begin{smallmatrix} \text{C}_4\text{H}_5 \\ \text{C}_4\text{H}_5 \end{smallmatrix} \} \text{O}_2$, etc.

4. The *ammonia type*, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \} \text{N}$, includes the nitrides and phosphides, the compound ammonias, and the amides; as, for example, ethylamine or ethylia, $\text{C}_4\text{H}_7\text{N} = \begin{smallmatrix} \text{C}_4\text{H}_6 \\ \text{H} \end{smallmatrix} \} \text{N}$; trimethylamine or trimethylia, $\text{C}_6\text{H}_9\text{N} = \begin{smallmatrix} \text{C}_3\text{H}_3 \\ \text{C}_2\text{H}_3 \end{smallmatrix} \} \text{N}$; benzamide, $\text{C}_{14}\text{H}_7\text{NO}_2 = \begin{smallmatrix} \text{C}_{14}\text{H}_5\text{O}_2 \\ \text{H} \end{smallmatrix} \} \text{N}$, etc.

Besides these three, or four principal types, there are *derived types*, *multiple types*, and *mixed types*; and under one or other of these types, primary and derived, multiple and mixed, all organic compounds can be arranged; and the theory of types leads to the

general conclusion, that all organic compounds, or, more strictly speaking, their molecules, may be regarded as molecules of hydrogen, water, ammonia, hydrosulphuric acid, etc., in which the hydrogen is entirely, or in part, replaced by organic radicals.—For further information on this subject, the reader is referred to Odling's *Lectures on Animal Chemistry*, 1866, and to the second volume of Gorup Besanez, *Lehrbuch der Chemie*, pp. 24–48. The chapter "On types," from this volume, has been reprinted separately in the form of a pamphlet.

TYPH-FEVER is a term which has sometimes been used to designate continued low fever. The best-marked varieties of this affection are known as typhus and typhoid fevers, which in typical cases are easily distinguished from one another, but not unfrequently so merge into one another that it is difficult to decide whether the disease should be classed as typhus or typhoid fever; and hence the general term typh-fever is a very convenient one in doubtful cases. All the typh-fevers belong nosologically to the miasmatic order of zymotic diseases.

TYPHA, a genus of plants, belonging to the natural order *typhaceæ* of some botanists, which, according to others, is a sub-order of *araceæ*. The *typhaceæ* all inhabit marshes or ditches. They have nodeless stems, unisexual flowers arranged on a spadix without a spathe, the spadix of the male flowers being situated at the summit of the stem, above that of the female flowers, the perianth consisting of scales or lax hairs, the anthers on long filaments, the fruit dry, consisting of the seed with adherent pericarp. They are found in very different climates, and scattered over the world. Two species of typha are found in Britain, *T. latifolia* and *T. angustifolia*, and are popularly known as CAT'S-TAIL or REED-MACE. *T. latifolia* is the most common. It is sometimes called bulrush. It grows to the height of five or six feet. The root-stocks are astringent and diuretic, and abound in starch. The young shoots both of this and *T. angustifolia*, a smaller plant, are much eaten by the Cossacks of the Don; and are sometimes used in England under the name of *Cossack asparagus*. The pollen of typha is inflammable, like that of *lycopodium*, and is used as a substitute for it. *T. angustifolia* and *T. elephantina* are employed in India for making mats and baskets.

TY PHON, in Egyptian mythology, was the Greek name of a son of Seb (Kronos) and Nut (Rhea). The latter gave birth to five children on the last five days of the year; first, Osiris and Haroeris, then Typhon, and lastly Isis and Nephthys. The Egyptian name of Typhon was Set, also Suti and Sutech, and in the earliest times he was a highly venerated god. He often appears on the monuments in the form of a beast, the cunning crocodile, the dreaded hippopotamus, or the obstinate ass, and with yellow hair and long blunted ears. From him the kings of the 19th dynasty, Seti (Sethos, Sethosis, changed by Herodotus into Sesostris), derive their name. The city of Ombos was a special seat of his worship. In later times, however, either about the close of the 21st dynasty or afterward, his worship was abandoned, and his figure and name were obliterated from many of the monuments. The cause of this curious religious revolution is unknown, but at any rate, Typhon came to be regarded as a god hostile to the Egyptians, and was gradually developed into a personification of the principle of evil—in short, the Egyptian devil, the opponent of holy doctrine, and adversary of Osiris—the god of the waste howling wilderness, of the salt lakes, of drought, and of scorching heat.

The connection between the Egyptian Set and the Greek Typhon is not very easy to trace, but it undoubtedly existed. According to Homer Typhon (called also Typhæon) was a huge giant, chained under the earth in the country of the Arimoi, and lashed by the lightnings of Zeus. Hesiod makes him a son of Typhœus and a hurricane, and, by the snake-goddess, Echidna, the father of the Chimæra, the many-headed dog Orthus, the hundred-headed dragon that guarded the apples of the Hesperides, the Colchian dragon, the Sphinx, Cerberus, Scylla, Gorgon, the Lernaean Hydra, the eagle that consumed the liver of Prometheus, and the Nemean lion. Typhœus, again, was the youngest son of Tartarus (hell) and Gæa (earth), or, as others say, of Hera (Juno) alone. At a later period the father and son coalesced into one person. Pindar describes Typhon as a monster with a hundred dragon-heads, fiery eyes, a black tongue, and a terrible voice. He sought to wrest the sovereignty of the world from Zeus, but after a fearful struggle, he was subdued by a thunderbolt from Olympus, and hurled into Tartarus, or buried under Ætna. The later poets modify the older myth with fabulous additions of their own. They connect Typhon with Egypt—a proof, perhaps, that he had come to be identified with the Egyptian Set. According to Ovid and others, all the gods fled before him into Egypt, and through fear, changed themselves into animals, excepting Zeus and Athene. After an appalling struggle, in the course of which Zeus was once hamstrung, and carried off by the daring monster, Typhon was vanquished, but not before he had hurled all mount Hæmus against his adversary, in a paroxysm of supernatural rage. It is very possible that the fierce physical opposition of Typhon (especially when the monster came to be identified with Set, the Egyptian devil) may have had (along with other causes) a material influence in determining that popular conception of "satan" which reigned both in patristic and mediæval times, and of which Milton has so largely availed himself in his *Paradise Lost*.

TYPHOONS (Chinese *tei-fun*, i.e. "hot wind;" the word, it need scarcely be said, has no connection with the Typhon of mythology) are violent storms which blow on the coast of Tonquin and China as far n. as Ningpo and the s.e. coasts of Japan. Varenius,

in his *Geographia Naturalis*, describes them as "storms which rage with such intensity and fury that those who have never seen them can form no conception of them; you would say that heaven and earth wished to return to their original chaos." They occur from May to November; but it is during the months of July, August, and September that they are most frequent. They resemble the storms of western Europe (see STORMS) in their general characteristics, with this difference, that the main features are more strongly marked. There is a depression of the barometer, over a space more or less circular in form, accompanying the typhoon, but it is generally more contracted in area, and deeper and more abrupt than in European storms. It is not uncommon for the barometer, at the center of the depression, to read 28.3 in., and on rarer occasions to fall even as low as 27 in.; and the changes of pressure are very rapid, frequently .2 or .3 in. in an hour. It is this enormous difference of atmospheric pressure between neighboring places, and the consequent rapidity of the fluctuation, which give to these storms their terribly destructive energy—the law regulating the strength of the wind being, that it is proportioned to the difference of pressure between the place from which it comes and the place toward which it blows. The low pressure in the center is confined to a very limited space, and since all around this space the pressure is greater, it follows that the level of the sea there will be higher. Hence, a high wave is frequently found to accompany these storms, advancing inland, carrying with it ruin and dismay, and not unfrequently bearing ships far over the level fields, where they are left stranded a considerable distance from the sea.

Typhoons have their origin in the ocean to the east of China, especially about Formosa, Luzon, and the islands immediately to the south. They thence proceed, in four cases out of five, from e.n.e. toward w.s.w., more rarely from e.s.e. to w.n.w., and scarcely ever from n. to s. or from s. to n.; in other words, their course is generally along the coast of China. The body of the storm advances at the rate of 12 m. an hour and upward, within which the winds blow often from 80 to 100 m. an hour, whirling round the center of atmospheric depression in a direction contrary to the motion of the hands of a watch, as all storms in the northern hemisphere do. They thus rotate in the direction s., e., n., w.; and travel along the coast, so that the coast feels the northern side of the storm, while at a distance from the coast the southern side is alone experienced. The s.w. monsoons (q.v.) prevail in summer over southern Asia, to the eastward of which are the n.e. trade-winds. See WINDS. Here, then, are two great aerial currents flowing contiguously, *but in opposite directions*, each highly charged with moisture, especially the s.w. current, which they have taken up from the oceans they have traversed. It is highly probable that the typhoons take their origin from these opposing currents, as whirlpools do at the meeting of two sea-currents; and their intensity is aggravated by the large quantity of heat disengaged in the condensation of the vapor of the atmosphere into the deluges of rain which fall during the storm—10 and 12 inches of rain frequently falling in one day. Much yet remains to be done toward the examination and explanation of this remarkable class of storms, the first and essential step being the establishing of meteorological stations on the Chinese coast, in Japan, in Formosa, and in Luzon.

TYPHUS AND TYPHOID FEVERS have so much in common, that to avoid repetition, we shall discuss them in one article. Until comparatively few years ago, it was generally believed that no definite distinctions could be drawn between the various forms of continued low fever met with in this country. In 1840, Dr. A. P. Stewart, lately one of the physicians to the Middlesex hospital, pointed out the differences which are now almost universally recognized between typhus and typhoid fevers; but his views received little attention till 1848–50, when Dr. Jenner,* physician to her majesty, published two papers on *The Identity or Non-identity of Typus and Typhoid Fevers*, and on *Diseases commonly confounded under the term Continued Fevers*. In these memoirs, Dr. Jenner shows, by evidence which must be satisfactory to every unbiased mind, that typhus and typhoid fevers differ, as Dr. Watson observes, "notably and constantly in their symptoms and course, in their duration, in their comparative fatality, in the superficial markings which respectively belong to them, and which warrant our classing them among the exanthemata, in the internal organic changes with which they are severally attended, and (what is the most important and the most conclusive) in their exciting causes."—*Lectures on the Principles and Practice of Medicine*, 4th ed., 1857, vol. ii. p. 795. In addition to typhus and typhoid, there is a third well-marked variety of continued fever, known as *relapsing fever*, which has been considered in a special article.

Typhus fever sometimes commences to show itself by certain premonitory symptoms, due to the depressing action of the poison—which, as will presently be seen, is the cause of the disease—upon the nervous system before it begins to affect the circulation. The patient, in these cases, is listless, unwilling to make any bodily or mental exertion, loses appetite, feels wandering pains over the body, is drowsy during the day, and restless at night. More commonly, however, the disease begins suddenly, a shivering fit being the first symptom. Severe headache, especially across the forehead, is another common early symptom. The muscular power rapidly becomes enfeebled, and the patient very soon feels compelled to take to his bed. As in typical cases of the disease, there are three sets

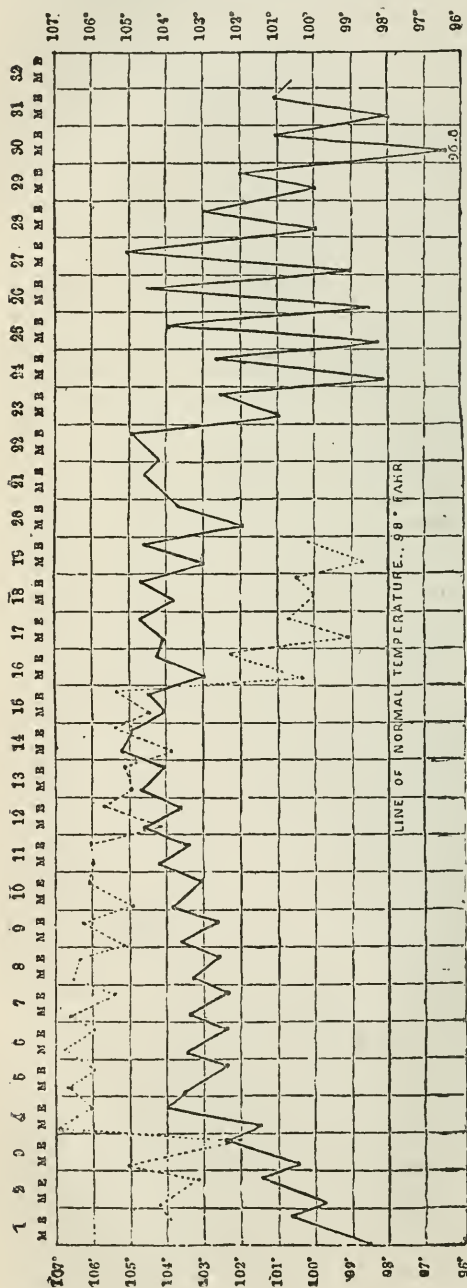
* Now sir W. Jenner, Bart.

of symptoms, each of which occupies about a week, it is convenient to divide the description of the continued fever into that of three weekly stages. In the first week, in addition to the symptoms already noticed, the heat of the skin becomes increased, and the pulse, which at first is hard, becomes soft and weak, and more frequent than in health, often now rising to 120, and in severe cases reaching 130 or 140 beats in a minute. According to Dr. Jenner, the pulse in uncomplicated *typhus* gradually rises to a maximum, preserves that rate for a variable time, and then slowly falls; while in *typhoid* it rises and falls irregularly. There is considerable thirst; the tongue becomes clammy and dry, and its center is covered with a white fur, which is often mesially divided by a straight brown streak, which is the first step to the blackness of that organ which afterward ensues. The intelligence is blunted; but on being sharply spoken to, the patient still gives rational answers. As the week advances, the strength is so reduced, that he lies on his back, and is unable to turn about in bed without assistance. In the second week, the pulse becomes more frequent, weaker, and more compressible, and the tongue grows drier and browner. The teeth and lips are invested with dark sordes, consisting of morbid epithelium that had been shed; and the weakness is now so extreme, that the patient sinks down in his bed. His voice becomes very feeble, and in bad cases he cannot swallow, nor can he put out his tongue. The two most remarkable symptoms of the second week are the delirium which seems to replace the headache, and about the ninth day ensues, and the appearance of the characteristic eruption. The delirium usually appears on the patient's awakening from sleep. He is inattentive to all that goes on around him, and usually lies still, muttering disjointed sentences, like a man talking in his dreams. Sometimes, however, he is more actively delirious, talking loudly, and trying to leave his bed. He may sometimes be roused by a strange voice, but soon relapses into his previous state. The senses are in a disturbed condition, the patient being commonly deaf, and, in advanced cases, often suffering from *muscæ volitantes* (q.v.), which gives rise to attempts to grasp these visionary objects, or to pick them from the bedclothes. This symptom, which is known in medical language under the name of *floccitatio*, is almost certainly indicative of a fatal result. The characteristic eruption, which Dr. Jenner calls the *mulberry rash*, may show itself as early as the fifth day, but most commonly appears at the beginning of the second week, and sometimes a little later. The characters of the rash vary with its age. It consists of very slightly elevated spots of a dusky pink color. Each spot is flattened on its surface, irregular in outline, with no well-defined margin, but fades insensibly into the line of the surrounding skin, disappears completely on pressure, and varies in size from a point to three or four lines in diameter. In two or three days these spots undergo a marked change. They no longer remain elevated above the surrounding cuticle; their hue becomes darker and more dingy than at first, and they now only fade on pressure, instead of completely disappearing. From this state they commonly grow paler, pass into faintly marked reddish-brown stains, and finally disappear. The spots composing this mulberry rash are generally very numerous, close together, and occasionally almost covering the skin. Sometimes, however, they are very few in number, situated at some distance from one another, and not to be distinguished at first from the *rose-spots* which, as will be presently seen, occur in typhoid fever. The mulberry rash is usually situated on the trunk and extremities, but is occasionally limited to the trunk, and in rare cases is seen on the face. No fresh spots appear after the third day of the eruption, and the rash subsides between the 14th and 21st days. The mulberry rash, though characteristic of typhus when it occurs, is not an essential symptom of the disease. Dr. Jenner states that in patients less than 15 years old, in whom the mortality is not more than 2 or 3 per cent, it is mostly either absent, or pale in hue and scanty in quantity; while in persons upward of 50 years of age, in whom the mortality is about 56 per cent, the rash is always present, and usually dark and abundant. Hence, as in the case of small-pox, the degrees of development of the eruption may be taken as a direct measure of the intensity of the disease. It is in the course of this second week that death is most apt to occur. Among 25 fatal cases noted by Jenner, nine deaths only occurred after the 15th day, and not one after the 20th. If the case is going to terminate fatally, symptoms commonly and expressively termed *putrid set in*; a peculiar fetor is exhaled from the breath and the surface of the body; the tongue is dry, black, and fissured; the teeth are covered with dark sordes, and sloughing bed-sores occur. The prostration increases to the last degree, and *subsultus tendinum*, or involuntary twitchings of the muscles of the face and arms, make their appearance. In some cases the ordinary stupor is replaced a day or two before death by the condition known as *coma rigel*. In this condition the patient never sleeps, but lies on his back, with the eyelids widely separated, the eyes staring and fixed in vacuity, the mouth partially open, and the face pale and devoid of expression. He is totally incapable of being roused to give a sign of consciousness, the pulse and breathing are hardly perceptible, and the skin is cool. The occurrence of death is only marked by the eye losing its slight luster, and the chest ceasing its slow and feeble movements. During the third week the symptoms gradually abate in those cases which are going to end in recovery. The patient often falls into a profound, quiet, and prolonged sleep between the 14th and 17th day, from which he awakes with a decided general improvement. The complexion is clearer, the delirium has disappeared, the pulse has fallen, and the tongue begins to show signs of moisture at the edges. In a few days the tongue gradually

becomes clean, the appetite becomes ravenous, and from that time the patient rapidly gains strength. In many cases the amendment is so gradual that it is impossible to say when it begins, and occasionally the favorable crisis is preceded by a temporary aggravation of the symptoms. A profuse sweat sometimes accompanies the favorable change. In the cases that terminate fatally there is no rallying from the symptoms described as occurring in the second week.

The fact that the difference between typhus and typhoid fevers was first recognized only a few years ago affords sufficient evidence that the symptoms of these diseases must be very similar. In describing *typhoid fever* it will consequently be sufficient if we indicate the leading points in which it differs from typhus.

Among the earlier symptoms (although they are sometimes postponed to the end of the first week), the most characteristic are abdominal pains and diarrhea. These are due to an ulcerated condition of the intestines, which will be presently noticed. The diarrhea is either spontaneous, or continues after the operation of a purgative. The stools are loose and frequent; and either of a dark color and fetid, or of a yellow, pea-soup-like appearance. The abdomen is found on examination to be unnaturally hard and resisting, tympanitic, and sometimes much distended; its shape, as Dr. Jenner was the first to remark, "is invariably the same, and somewhat peculiar. Its convexity is from side to side, and not from above downward. The patient is never pot-bellied, but tub-shaped; the cause probably being that the flatus occupies the colon, ascending, descending, and transverse." Pressure over the region of the cæcum frequently excites uneasiness, and usually gives rise to a peculiar gurgling movement, which is both audible and palpable, and doubtless arises from the intermixture of liquid and gaseous matters in the bowels. This gurgling is a still more common symptom at a more advanced stage of the disease, and is of the greater importance since it is rarely met with in typhus or any other disorder. An eruption usually appears at from the 8th to the 12th day of the disease. This typhoid rash is very different from that occurring in typhus; it consists of slightly elevated papulæ or pimples, with their heads rounded, and their bases gradually passing into the level of the surrounding cuticle. These papulæ are circular, and of a bright rose color, which fades insensibly into the hue of the surrounding skin. Throughout their whole course they disappear completely on pressure, and reappear when the pressure is removed. Each papula lasts three or four days, and fresh ones make their appearance every day or two after their first eruption. The number present at a time is usually from six to twenty, but their limits may range from 1 to more than 100. Their average size is a line in diameter, and they chiefly occur on the abdomen, chest, and back. As a general rule no fresh spots occur after the 30th day. The diarrhea, to which reference has already been made, continues with the progress of the disease, the patient often having from three to six evacuations daily, and often unconsciously passing them in bed.



This persistence of the diarrhea is one of the results of ulceration of the bowels. Another result of this ulceration is the occurrence of hemorrhage from the bowels, which is one of the most alarming of the symptoms of typhoid fever. It occurs most frequently during the third and fourth weeks, and varies from a mere stain to a large amount. Sometimes the blood thus poured out by the ulceration of the mesenteric veins is retained in the bowel, and is only discovered after death, the clots being unable to pass through the valve of the cæcum. This hemorrhage is always an extremely bad symptom, and may either cause immediate fainting, or may so weaken the patient as to cause him to succumb to the disease.

The ranges of temperature in typhoid and typhus fever differ very considerably, and although the range in a mild case of either of these diseases differs considerably from the range in severe cases, the foregoing diagram, copied by Dr. Aitken from Wunderlich and Traube, shows the typical ranges of temperature in these diseases contrasted throughout their course, from the beginning to the end of the disease. The records indicate morning (M) and evening (E) observations. The dotted lines indicate the *typhus* range, and the continuous dark lines indicate the range in *typhoid*. This diagram is so plain as to require no explanatory details. It is worth while, however, to direct the reader's attention to the rapid changes which in typhoid occur on and after the 22d day, and in typhus about the 15th day. With regard to the duration of the two diseases, Dr. Jenner found that the average duration of *fatal* cases of typhoid was 22 days, and of typhus 14 days; the former disease may terminate *favorably* during the fourth week, and the latter from the 13th to the 17th day.

In cases of recovery from typhoid, a remarkable fatuity remains for a considerable time; a childishness of mind often remaining for more than a month after apparent restoration to health. "The patient," says Dr. Aitken, "generally wakes up, as it were, from the fever, a complete imbecile. The whole man is changed. He seems to have renewed his youth. Childhood and infancy return, and the greatest care is necessary to prevent untoward events. No man can be considered as fit for work or for general military service for three or four months after an attack of severe typhoid fever."—*The Science and Practice of Medicine*, 3d ed., vol. i. p. 332.

Typhoid fever is essentially a disease of childhood and adolescence, the average age at which it occurs being 21½ years, and it being very rarely that a person aged more than 50 is attacked; while typhus attacks persons of all ages, from early infancy to extreme old age.

The appearances presented on the examination of the body after death are very different in these diseases. While in *typhus* the most common morbid appearances are a fluid condition of the blood; hyperemia of the cerebral membranes, and increase of inter-cranial fluid; bronchial catarrh and pulmonary congestion, especially at the posterior part of the lungs, which are more or less collapsed; softening of the heart, liver, and spleen, and enlargement of the kidneys; in *typhoid*, there is one constant and characteristic lesion, viz., a morbid condition of the agminated glands (or glands of Peyer) and solitary glands of the small intestine, and especially of the former. These morbid changes may be briefly summed up as follows: Thickening, redness, tumefaction, and finally ulceration or sloughing of the glands, the ulceration always occurring in the lower third of the small intestine. On the assumption that the natural office of Peyer's glands is, as Dr. Carpenter suggests, to separate noxious matters from the blood, and to discharge them into the intestinal canal, Dr. C. J. B. Williams suggests that the ulceration so constantly met with in typhoid fever may result from the continued operation of the poison of that disease, thus escaping. When these changes proceed as far as ulceration, the case is one of extreme danger, although death does not necessarily ensue, because the scars left by healed ulcers are often seen when patients, who have had typhoid fever, have subsequently died from some other disease. The existence of these ulcers is, however, likely to prolong the illness after the fever itself has ended; to protract convalescence, and to hinder recovery; and to endanger life, even in cases of apparent convalescence, by causing hemorrhage or perforation of the bowel. This perforation, which gives rise to intense peritonitis, occurs in about one in five fatal cases, and generally takes place through the ileum near the valve.

We now proceed to notice the origin and mode of propagation of these two diseases, beginning with *typhus*. There is undoubted evidence that all the forms of continued fever are contagious, and it may now be regarded as an established fact, from the investigations of Dr. Jenner, that one species of fever cannot generate another, but that each is produced solely by its like; that typhus, for example, always propagates typhus, and never any other form of fever, as typhoid or relapsing fever. Some persons may, by some peculiarity of constitution, be able to resist the action of the poison, while others are peculiarly susceptible to it. An attack of fever generally exerts a certain amount of protective power against another attack of the same kind of fever; and *habit* has a good deal of power in fortifying the system against contagion, just as confirmed drunkards or opium-eaters can with impunity swallow doses of their respective poisons which would prove highly dangerous to a novice. "Upon this principle," says Dr. Watson, "has been explained the comparative immunity from contagious diseases, under like circumstances of exposure, of medical practitioners and nurses; of the keepers of filthy lodging-houses, while the new-coming inmates suffer; and even of prisoners, who, with-

out having had the disease themselves, may nevertheless carry forth and communicate the infection, as is said to have happened at the celebrated 'black assizes' at Oxford, and again at the Old Bailey in the year 1750."—*Lectures on the Principles and Practice of Physic*, 4th ed., vol. ii. p. 829. Whether typhus can be generated *de novo* by great overcrowding and vitiation of air, by the organic impurities emanating from the respiratory and other functions, is still a disputed question. The conditions essential to its propagation are (1) overcrowding, combined with deficient ventilation; (2) personal filth, and clothes saturated with cutaneous exhalations; and (3) an impaired condition of the system, such as may result from insufficient food, scurvy, and any other debilitating causes. The patient is most dangerous as a focus of infection after the end of the first week to the period of convalescence, the peculiar odor from the skin and lungs being then the strongest. If the poison be very concentrated, the disease may be caught by exposure to it for only a few minutes. The infected person may actually be conscious when the poison is taken in. Dr. Banks of Dublin, in an excellent lecture which he delivered on April 24, 1866, in the theater of the Richmond hospital, "On the Origin and Classification of Fevers," states that this happened in his own case, while examining the chest of a person laboring under the disease. "The patient," he observes, "was seized with cough, and I was so placed that I must have inhaled his breath. The odor was peculiar and intolerably offensive. I was certain that I had imbibed the poison; and after a latent period of three days, I exhibited the usual train of symptoms which usher in typhus of the severest form." The most common latent period is nine days.

From the investigations of various physicians, among whom Dr. William Budd deserves especial notice, it appears that the living human body is the soil in which the specific poison of *typhoid* fever breeds and multiplies. The origin of the disease is unknown, but the poison is communicated or contained in the diarrheal discharges which issue from the diseased intestine. These discharges, as they dry up, preserve the germs of the disease; and if, through atmospheric or other agencies, these germs enter the living body, they communicate the disease, and diarrhea soon commences. As the evacuations contain the specific virus of typhoid fever, the disease may be propagated among healthy persons (1) by percolation through the soil into the wells which supply drinking-water; (2) or by issuing, through defects in the sewers, into the air which is inspired; or (3) by exhalation through the apertures of small ill-trapped water-closets or privies, which are at once the receptacles of the discharges from the sick, and the daily resort of the healthy. The atmosphere thus infected with the poison is far more dangerous than that immediately surrounding a fever-patient.

For a knowledge of the means of checking the spread of typhoid fever, society is deeply indebted to Dr. Budd's researches; and provided these means are thoroughly and efficiently carried out, it is believed by many of the most eminent physicians that the recurrence of this disease might be entirely prevented. In order to judge of the extent of the infection to be destroyed, there are two points to be considered—*viz.*, *first*, the amount and duration of the intestinal discharge in each case; and *secondly*, the number of cases actually occurring. With regard to the first point, the diarrhea lasts on an average 15 days. With regard to the second point, the reports of the registrar-general show that at least 100,000 to 150,000 cases of typhoid fever occur annually in England alone; or, in Dr. Budd's emphatic words, "every year in England, more than 100,000 human intestines, diseased in the way already described, continue each, for the space of a fortnight or thereabouts, to discharge upon the ground floods of liquid charged with matters on which the specific poison of a communicable disease has set its most specific mark." He suggests the following details of procedure, which should be invariably attended to as soon as this disease appears: 1. All discharges from the fever-patient should be received, on their issue from the body, into vessels containing a concentrated solution of chloride of zinc. 2. Two ounces of a caustic solution of chloride of zinc should be put in the night stool on each occasion before it is used by the fever-patient. 3. All tainted bed or body linen should immediately on its removal be placed in water strongly impregnated with the same agent. 4. The water-closet should be flooded several times a day with a strong solution of chloride of zinc; and some chloride of lime should also be placed there, to serve as a source of chlorine in the gaseous form. 5. So long as fever lasts, the water-closet should be used exclusively as a receptacle for the discharges from the sick. For further details as to the various precautions to be taken with a view of checking the spread of this and other epidemic diseases, the reader is referred to Mr. Simon's "General Memorandum," published (in 1860) in his *Third Report on the Public Health in England*.

Although typhoid is contagious, Dr. Jenner holds that it is "infinitely less so than typhus." Hence in typhus a large room should, if possible, be selected for the patient, and the air should be kept fresh by having a window or door, or both, open. Curtains, carpets, and all superfluous furniture should be removed, and the body of the patient should be kept as clean as possible by ablution, and his sheets and night-shirt frequently changed; the latter being at once plunged into water containing chloride of zinc. As the susceptibility to the disease diminishes with the advance of life, middle-aged attendants should be selected; and all who approach the sick-bed should avoid as far as possible inhaling the patient's breath or the emanations from his skin. Friends occasionally visiting the patient should do so after a meal and a glass of wine or ale. Formerly it

was the practice to distribute cases of typhus fever in the general wards of hospitals—the rule being to distribute them scantily among the general patients. This practice came to be looked on as unadvisable; and now each hospital is provided with its fever-house to which cases of typhus are strictly limited.

From a most careful critical study of the history of fever generally, including chemical and microscopical examination of the excretions, Dr. Parkes arrives at the conclusion, that the *general treatment of fever*, including typhus and typhoid fevers, may be summed up “as being a combination of measures to *reduce excessive heat, to insure proper excretion, and to act on the semi-paralyzed nerves.*” The special indications for the treatment of *typhus* are: 1. To neutralize the poison, and to correct the morbid state of the blood. Hydrochloric acid is strongly recommended for this purpose; it may be given to the extent of a fluid ounce of the dilute acid daily, mixed with a quart of barley-water sweetened with syrup of ginger, and flavored with lemon-peel. 2. To eliminate the poison and the products of the destructive metamorphosis of tissue. For this purpose, alkaline salts may be prescribed to act on the kidneys and skin, and purgatives are often useful. 3. To reduce the temperature. 4. To sustain the vital powers, and to obviate the tendency to death; nourishment in the form of milk and water, coffee, broth, beef-tea, etc., must be administered at least once in every three or four hours, after the fourth day of fever, and alcoholic stimulants are usually serviceable about the seventh or eighth day. Great discrimination is required in prescribing them, and we are mainly indebted to the Dublin school—to Graves and Stokes—for pointing out the importance of the cardiac and radial pulses as guides for the use of alcohol in fevers. When the cardiac impulse becomes weak, and when the first sound of the heart is impaired or absent, stimulants should be freely given; and an irregular, intermitting, abnormally slow, or imperceptible pulse affords a similar indication. 5. To relieve the distressing symptoms, such as the headache, sleeplessness, and delirium; and 6. To avert and subdue local complications.

In *typhoid fever* the chief indications of treatment are (1) to reduce the temperature, and subdue any vascular excitement that is present in excess; (2) to restrain excessive diarrhoea for which purpose milk and lime-water in equal parts may be taken as a drink. The discharge ought not to be altogether checked, and prof. Gairdner prefers giving saline laxatives to astringents, and at the same time recommends that the lower bowel should be unloaded by warm-water injections, to which a little asafetida or aniseed is added. In cases in which it is doubtful whether to check or encourage diarrhoea, the physician will generally be on the safer side if he discourages the action of the bowels. (3) To stimulate the nervous system by proper food, and possibly by stimulants; (4) to maintain the free action of the kidneys, which is best effected by the administration of small doses of the alkaline carbonates, or of cream of tartar; (5) to influence the elimination of morbid matter from the affected intestinal glands. For this purpose, 1 or 2 grains of calomel should be given twice a day till about the 10th day, but not later. Special symptoms, such as great inflation of the abdomen (known as meteorism), hemorrhage from the intestines, etc., must be treated by the ordinary rules. Probably the best single remedy for this form of hemorrhage is oil of turpentine in doses of from 5 to 20 drops every hour or two. It is best administered in the form of an emulsion with gum-arabic, white sugar, and water. The diet is a subject of the utmost importance from the beginning of the disease till complete recovery ensues. From the various forms of farinaceous food, such as arrow-root, rice, sago, tapioca, bread, etc., from eggs beaten into custard, and milk with or without lime-water (or, preferably, effervescent Carrara water), an abundant, bland, and nourishing dietary can be selected. All animal food, excepting eggs and milk, must be rigidly prohibited. Even beef tea and mild broths have often been found to exert a special irritant action on the overcharged glands of the ileum. During the period of convalescence, no meat should be allowed till at least a week has elapsed after all the febrile symptoms have vanished, and the only admissible means of opening the bowels are by castor oil or simple enemata.

Both typhus and typhoid fever have been described under various names. Typhus has been popularly known as the jail fever, hospital fever, putrid fever, brain fever, bilious fever, spotted fever, camp fever, etc.; while from the peculiar lesions which are associated with it, the terms enteric fever, and intestinal fever, have been suggested as appropriate synonyms for typhoid. Its latest name, for which Dr. Murchison is responsible, is pythogenetic fever, or fever born of putrescence. If the term *intestinal fever*, suggested by Dr. W. Budd, were adopted, much confusion would be prevented.*

Had our space permitted, we should have given a brief historical sketch of the principal epidemics of typhus fever. To confine ourselves to the present century, it may be mentioned, that during its first 15 years the ravages of typhus in the armies of Napoleon, and among the population of the countries which were the seat of war, were perfectly appalling. In May, 1812, the Bavarian army serving with the French numbered 28,000 men; in Feb., 1813, the number was reduced to 2,250, the great destroyer being typhus. In Mayence alone, of 60,000 French troops composing the garrison in 1813-14, there died of typhus alone, in six months, 25,000 men. During the spring of 1856, more than

* Cases of continued low fever, whether typhus or typhoid, are frequently spoken of popularly and vaguely as *gastric fevers*; but the term is not recognized by the medical profession.

17,000 men of the French army in the Crimea perished from this disease in less than three months. According to Parkes, typhus fever occupies the fourth place among the causes which have produced loss of life in the British army, the three more potent causes being (1) a defective commissariat; (2) undertaking military operations in an unhealthy site, and with an unhealthy season impending; and (3) exposure to cold, with insufficient clothing and food. The present article, comparatively long as it is, contains but a very meager outline sketch of the history and treatment of two of the most important diseases affecting the human body.—For further details, the reader is referred to Aitken's *Science and Practice of Medicine*, 2d ed., vol. i. pp. 374-474, and to Dr. Murchison's *Treatise on the Continued Fevers of Great Britain* (1863).

TYR is the old Norse name of a god, who, however, did not belong exclusively to the northern mythology, but was common also to the German, being called in old High-German *Ziu* or *Zio*, and in Ang.-Sax. *Tiu*. He was the son of Odin, and was the god of war and of fame, which idea is expressed in old Norse by the word *tyr*; and when the Romans and Greeks speak of a Mars or an Ares among the Germans, it is Tyr that is meant. According to the Edda, he was single-handed. When the Asa-gods persuaded the wolf Fenrir to allow himself to be bound with the bandage Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened; and when the gods refused to release him, the wolf bit off Tyr's hand to the wrist, which was called, in consequence, *uflithr*, or the wolf's joint. In the twilight-battle of the gods, he meets his death at the same time with his enemy, the monster dog, Garmr. The old Norse Runic character *᚛* bore the name of the god. The third day of the week, too, the *Dies Martis* of the Romans, is called after him, in old Norse, *Tyrsdagr*; Ang.-Sax., *Tuesday* (from which our English *Tuesday*); old Friesic, *Tysdei*; old High-German, *Ziuwestac*; in the n. of Germany, *Tiestac* or *Diestac*, from which the German of the present time, *Donstag*. Places, and in particular hills and plants, were named after him. The word Tyr appears in epithets of Odin, signifying god in a general sense; as, for example, *Sigtir*, that is to say, the god of victory; also in epithets of Thor, as *Reidhartir*, the god of the chariot or of thunder.

TYRANT (Gr. *tyrannos*, Doric for *kóiranos*, from *kuros* or *kurius*, a lord or master), a name given in modern times to an arbitrary and oppressive ruler, but originally applied, not necessarily to one that exercised power badly, but merely to one that had obtained it illegally, and therefore equivalent to our word *usurper*. The ancient Greek "republics," it must be remembered, were generally aristocratic and even oligarchic in their constitution. When the "governing families" among the Athenian or Syracusan nobles, for example, quarreled with each other, it was natural, if they could not otherwise agree, that the boldest and most reckless of the set should seek for success by allying himself with the masses of the people, should figure as their champion, promise to redress their wrongs or increase their comforts, and when a fitting occasion presented itself, should, by a clever if somewhat violent stratagem—*coup d'état*, it is now called—deliver them from the domination of his order by himself grasping possession of absolute power, and ruling without any other restraint than the necessity of retaining his popularity imposed—even this limitation being frequently absent when a body-guard of foreign mercenaries rendered it superfluous. If the political adventurer who thus rose on the ruins of the constitution happened to be a man of sense, and wisdom, and generosity, his "tyranny" might prove a blessing to a state torn by the animosities of selfish oligarchs, and be the theme of praise in after-ages, as was the case with the "tyrannies" of Peisistratos (q. v.), Gelon (q. v.), Hiero II. (q. v.), and many others; but if he was insolent, rapacious, and cruel, then he sought to reduce the citizens to a worse than Egyptian bondage, and his name became infamous to all time. Such has been the fate of most of the "thirty tyrants of Athens" (q. v.), more particularly of the blood-thirsty Critias, of Alexander of Phere, of Dionysius the younger, etc. It was the method of exercising authority pursued by these and similar usurpers that latterly, even in ancient times, gave the word tyrant that evil significance it has ever since uninterruptedly retained.—See Plasz, *Die Tyrannis bei den Griechen* (Bremen, 1852); Wachsmuth, *Hellen. Alt.*, vol. i. pp. 279-88; and the histories of Thirlwall and Grote.

TYRANT SHRIKE, the popular name of a section of the shrike family (*laniada*), connecting that family with the fly-catchers (*muscipula*), and entirely American. In the genus *tyrannus*, the bill is straight, rather long, strong, the upper mandible rounded above, the point suddenly hooked. The birds of this genus are remarkable for their fierce and bold disposition. They are always ready for battle, and often engaged in it. In defense of their young, they rush against any aggressor. The tyrant shrike, **TYRANT FLY-CATCHER**, or **KING-BIRD** (*T. intrepidus*) of North America, has no hesitation in attacking an eagle, rising above him and pouncing down upon him. This species migrates northward in summer as far as lat. 57°. It feeds much on the larvæ of insects, but has an unfortunate fondness for bees, and will take its post on a fence or bush near a hive, to dart upon them as they depart or return; on which account it is disliked by American farmers. The true tyrant shrikes (*tyrannus*) have the plumage of white and black, variously blended; but in the genus *tyrannula*, which approaches more to fly-catchers, the plumage is almost always olive-colored, serving for their concealment among foliage.

TYRCONNEL, RICHARD TALBOT, Duke and Earl of, b. early in the 17th century. In his youth, according to lord Macaulay, he was "one of the most noted sharpers and bullies of London." Soon after the restoration, he endeavored to obtain the favor of the royal family by blackening the reputation of Anne Hyde, so as to furnish the duke of York with a pretext for breaking his promise of marriage to her. Though unsuccessful in this, he succeeded in gaining the favor of the duke, and contrived to make himself welcome at the palace both as a votary of its pleasures and as a counselor in affairs of state. Immediately on the accession of James II., he was made earl of Tyrconnel and put in command of the troops in Ireland; and in 1687, by fawning, bullying, and bribing, he got possession of the office which had long been the object of his ambition—he was appointed lord-deputy of Ireland. His arrival in that country spread terror and dismay through the English Protestant population, who had already suffered somewhat under his military rule. Events quickly justified their terrors. Nearly every office of dignity in the country was soon transferred to the hands of the Roman Catholics. The Protestant party, so long dominant, complained bitterly that they had become a laughing-stock even to their own servants, and that to appeal to law was vain; judgment in every case being given for the native against the Englishman. But this state of matters did not last long. The revolution of 1688 had a sudden and sobering effect upon the rule of the lord-deputy; and there can be little doubt that he would have submitted to William III.; but the Irish people threatened that if he dared to sell them for wealth or honor, they would burn the castle and him in it, and put themselves under the protection of France. On the arrival of James in Ireland in 1689, he created the earl, duke of Tyrconnel. After the fatal battle of the Boyne, at which he held high command, he retired to France. In 1691 he returned to Ireland, with a view to furthering the efforts in favor of James, which were still being made by his adherents. Notwithstanding the defeat of Aghrim (July 12, 1691), and the capitulation of Galway, he made preparations for the defense of Limerick, binding himself and his countrymen by an oath not to surrender until they received permission from James, then at Saint Germain. He at the same time dispatched a letter in which he stated his conviction that all was lost. On Aug. 11, before an answer could arrive, he was struck with apoplexy. He died on the 14th of the same month. He has been characterized by Macaulay as "the fiercest and most uncompromising of all those who hated the religion and liberties of England." He was survived until 1730 by his wife—"la belle Jennings," of the court of Charles II. This lady, so famed for her beauty and fascinating manner, entered life as maid of honor to the duchess of York; in which position she conducted herself with a propriety which, time and place considered, may almost be pronounced unique. As wife of the duke of Tyrconnel, during his rule in Dublin, her conduct seems to have been characterized both by dignity and purity. It is narrated that when James and her husband, fleeing from the defeat of the Boyne, reached her residence so bespattered with mud as to be scarcely recognizable, she dressed herself richly, and received the fugitive king and his attendants with all the splendor of court etiquette. She died in a small private nunnery in Dublin in circumstances of great poverty. See Macaulay's *History of England*, vols. ii., iii., and iv.; Chambers's *Book of Days*, vol. i., ed. 1863, p. 310; Mrs. Jameson's *Memoirs of Beauties of the Court of Charles II.*, vol. ii., p. 223.

TYRE (Phen. *Sûr* or *Sôr*, rock), a city of ancient Phenicia, situated in lat. 33° 12' n., which probably derived its name from the double rock on which it was first founded. It was a matter of doubt among the ancients themselves whether Tyre or Sidon was the older of the two, and the question is not easily to be settled. So much, however, seems certain, that Tyre had existed already independently for a long time, when Sidon, defeated by Ascalon, transferred herself almost bodily to the former (see PHENICIA). There were two towns of Tyre closely connected together in historical times; one on the continent, the other on the island opposite, together embracing about 19 Roman miles. The more important of the two was the continental town, called Pale Tyrus; while the island-town served more or less for the purpose of store-houses, manufactories, arsenals, and the like. The situation of the entire city was one of the most fertile, and its magnificent combination of land and sea scenery formed the theme of many an ancient poet and seer.

Nothing but myths have come down to us respecting the earlier period of its existence. History begins to dawn upon us with Abibal, the predecessor of the biblical Hiram, under whose rule (980-47 B.C.) Tyre attained to its full glory and renown. An alliance with Solomon was also entered into; trading expeditions were undertaken jointly by the Israelites and the Phenicians, and Solomon is supposed even to have married Hiram's daughter. During Hiram's reign, Tyre was much enlarged and embellished; and its two roadsteads and harbors, the wonders of the ancient world, probably date from the same period. He was followed, according to ancient writers, by Balæstartus; after him reigned, for brief periods, his four sons, by the murder of the last of whom the throne became hereditary in the house of Ithobaal, the Ethibaal of Scripture, whose daughter was married to Ahab. Tyre then appears to have gained the supremacy over Sidon, and also spread her colonies far and wide. Shortly after the death of this king, Carthage was refounded by Elissa (Dido), about 813 B.C., in consequence of a popular demonstration, which deprived her of the throne in favor of Pygmalion. This

"new city" gradually diminished the importance of the old one; at least Tyre seems to have been weakened to such an extent by the emigration of its best elements, that it disappears from history until the three great powers, Chaldea, Assyria, and Egypt, by turns endeavored to make themselves masters of the Tyro-Phœnician coast, with its eastern and western trade. Shalmaneser, king of Assyria, reduced Tyre, after a long siege; and the whole of Phœnicia, the most important places of which had already thrown off their allegiance to Tyre, was rendered tributary to Assyria. During the Chaldeo-Egyptian struggle, Tyre, again at the head of the country, sided with Egypt, and was conquered by the Chaldeans. Once more the Phœnicians attempted to throw off the foreign yoke, and Nebuchadnezzar marched against them at the head of his armies. Having taken Jerusalem (587 B.C.), he reduced the whole sea-coast, except Tyre, which stood a thirteen years' siege by water and by land, ending, not in subjection, but only in a kind of apparent submission, leaving the native sovereigns on their thrones, and their wealth and power untouched. In 538 B.C., Cyrus became master of Phœnicia, which at that time again stood under Babylonian supremacy, and the hegemony was bestowed upon Sidon. For a long time, Phœnicia prospered under wise Persian rulers; but when Xerxes, in his Greek wars, had completely destroyed the Phœnician fleet, and exhausted nearly all her resources, the exasperated inhabitants rose once more, but only to be utterly crushed. Sidon, at the head of the revolution, was fired by its own inhabitants, and once more Tyre resumed the lead (350 B.C.). Having refused to pay allegiance to Alexander the great (after the battle at Issus), it was besieged by him in 332 B.C., and fell after a seven months' hard resistance. Alexander replaced the old inhabitants by new colonists, chiefly Carians, and though the city had sustained all but complete destruction, it yet rose again after a very brief period to wealth and power, and already in 315 B.C., was able to hold out for 18 months against Antigonus. Under the Romans, Cleopatra received Tyre as a present from Antony; but the last trace of its independent existence was taken from it by Augustus. A Christian community was founded there at an earlier period. The trade and manufactures of Tyre, aided by her exceptionally favorable naval position, insured for it, even under Roman dominion, a high place among its sister cities; and once more, in 193 A.D., it even took an active part in the contest between Septimius Severus and Pescennius Niger, which, resulting in the success of the former, brought back to it some of its ancient distinction. In St. Jerome's time, it was again the noblest and most beautiful city of Phœnicia, nay, one of the most prosperous and noble cities in the whole east. In the 7th c., it came under the dominion of the Saracens, and so remained until taken by the crusaders; and in 1192 A.D. became the northern boundary of Christian territory in Palestine. It continued to flourish—still chiefly through its world-renowned purple—until 1516 A.D., when the conquest of Selim I., together with the newly discovered route to Asia by the cape of Good Hope, put an end to its wealth and commerce, and almost to its existence. Although there has been a slight improvement in its prospects of late, the desolation and wretchedness of that once magnificent city are still most striking. From 3,000 to 4,000 inhabitants now dwell among the ruins of its ancient glory, finding scanty livelihood in insignificant exports of tobacco, cotton, wool, and wood. Frederick Barbarossa and Origen are both buried here.

TYRNAU (*Magyar Nagy-Szombath*), a t. of Hungary, co. of Ober-Neutra, on the river Trna, about 30 m. n.e. of Presburg. It has so many churches and convents that it has been nick-named "little Rome." Tyrnau carries on manufactures of cloth, linen, woad, etc., and has a tolerably lively general trade, especially in wine. From 1635 to 1774, it possessed a university, which in the latter year was transferred to Pesth. Tyrnau is likewise famous for a huge cask, which can hold twice as much as the great Heidelberg one. Pop. '69, 9,737.

TYROL (in German more commonly spelled *Tirol*; not spoken of as *das Tirol*, though usually called in England *the Tyrol*) forms with Vorarlberg the most westerly province of the Austro-Hungarian monarchy, and borders n., w., and s. on Bavaria, Switzerland, and Italy. Area, including Vorarlberg, 12,311 sq.m.; pop. '69, 885,789.

Surface.—The Tyrol may be regarded as an eastern continuation of Switzerland. It is traversed from e. to w. by the great chain of the Alps, and is encircled on all sides by lofty ranges. It consists, however, almost entirely of three great valleys—(1) one running e. and w. n. of the great Alps, and drained by the Inn; (2) one s. of the Alps, also running e. and w., and drained by upper tributaries of the Adige or Etsch; (3) one running s. from the middle of the last, and drained by the main stream of the Adige. These valleys are surrounded by a circuit of mountains. The northern valley is separated from Bavaria by the Algau Alps. The southern valley is bounded on the e. by the Trent Alps; on the w. by the Örtler Alps, which, like protecting walls, run s. into the plain of Lombardy. The main chain is crossed toward the center of the Tyrol by a deep depression, in which lies the Brenner pass (elevation, 4,657 ft.). It is the lowest of the great passes of the Alps, and that over which runs the great commercial route connecting Italy and Germany.

The dialect and manners of the Bavarians prevail in the northern and middle valley. The dialect and manners of Lombardy, on the other hand, have crept up the third valley to a boundary-line which rests upon the mountains which bound the middle valley

on the south. Hence the most important divisions of the Tyrol are into the German Tyrol and the Italian Tyrol. The German Tyrol is divided into (1) the Oberinthal, or the Upper Inn valley; (2) The Unterinthal, or the Lower Inn valley; (3) the Vintschgau; (4) the Etsch district; and (5) the Pusterthal, the three last belonging to the middle valley of the Tyrol. Beyond the geographical limits of the Tyrol the Austrian province of the Tyrol includes (6) the Vorarlberg, a district drained by streams which fall into the lake of Constance, and in which a dialect is spoken resembling those of German Switzerland; and (7) the Lienz district, on the Drave, in which the language of the people is Austrian. The Italian Tyrol is divided into (1) a northern valley, or that of Trent; (2) a southern valley, or that of Roveredo; (3) the valley of the Sarca, or district of Riva, on lake Garda.

Geology and Soils.—The rocks of the Tyrol are chiefly crystalline Silurian and secondary, with obtruding granites and traps. The chief mineral products are iron, rock-salt, worked near Innsbruck, and marble, quarried in the south. The tertiary strata of the Swiss and Swabian plains are totally wanting; and it is only along the water-courses that level tracts of recent formation are found. These tracts are the only parts of the country admitting of cultivation by the plow, and they very seldom attain a width of more than half a mile. Taken altogether, they do not form more than one-tenth of the whole country.

Climate.—The loftiest mountains of the Tyrol are in the main chain of the Alps—the Gross Glockner (12,776 ft.), e. of the Brenner pass, and mount Gebatsch (12,276 ft.) w. of it, and, in the Ortler chain, the Ortler Spitz (12,818 ft.). These mountains are covered with vast glaciers, which descend, like those of Switzerland, far into the valleys. Between 6,000 and 5,000 ft. snow disappears in summer, and Alpine plants and grass cover the hills, diversified here and there with stunted bushes. Into this region the herds are driven, as in Switzerland, during the summer months. Below 5,000 ft. the firwoods abound; potatoes and a few vegetables are cultivated, and houses permanently occupied make their appearance. The beech replaces the fir at 4,000 ft., and agriculture begins, the chief grains being rye and barley. Wheat is not cultivated with success at a higher elevation than 2,000 feet. In the lower part of the southern valley, the temperature is highest, and indeed the climate is that of northern Italy; tobacco, the fig, the olive, and the mulberry being enumerated among the chief objects of cultivation. Out of every 100 acres of the Tyrol, 30 are inaccessible mountain-tracts, 40 forests, 20 commons and meadows, and 10 corn-fields and gardens.

Industry.—The industry of the Tyrol is not important. There are, however, glass and paper factories near Innsbruck; and carpets, linens, gloves, and straw hats are manufactured extensively for home consumption. Wooden ware is also largely produced. The rearing of canaries is a business which was long a monopoly of the northern Tyrolese, who supplied all Europe with these birds. The exports from the Tyrol consists of cattle, cheese, timber, wine, tobacco, silk, iron, and salt. The imports are grain and manufactured goods. The transit-trade between Italy and Germany gives employment to a large number of the inhabitants. Thousands migrate annually into neighboring countries, to sell their wood wares, gloves, and carpets. Railways have for a number of years connected Innsbruck with Munich, and Botzen with Verona; and in 1867 the section between Innsbruck and Botzen, over the Brenner pass, was opened, which completed the first railway communication between Italy and Germany.

Inhabitants.—The northern or German Tyrolese bear to the southern or Italian, the proportion of three to two; and the habits and language resemble those of the adjoining parts of Italy and Germany. In the Tyrol, according to the census, the inhabitants are all Catholics, with the exception of 358 Jews, 1235 Protestants, 29 Greek Christians, and a few members of other sects. The Tyrolese have an independent national diet, meeting at Innsbruck, in which are represented all classes of the population, the clergy, the nobility, the people of the country, and those of the towns. There are, to some extent, separate administrative arrangements for the Italian districts. Education is now very generally diffused, and one of the nine Austrian universities is at Innsbruck.

History.—The history of the Tyrol is partly German and partly Italian. In early times the Tyrol formed part of Rætia, and was conquered by the Romans, 15 B.C. Subsequently it was overrun by various German tribes; still later the southern valley fell to the share of the Lombards, the two northern valleys to the Bavarians. The latter valleys were divided into *gaus*, which ultimately became petty lordships, acknowledging the supremacy of the dukes of Bavaria. These lordships, however, in the course of time, came to be represented by two families who intermarried. Then the whole German Tyrol was governed by one family of counts, whose paternal abode was the mountain fortress of Terioli, or Tyrol, near Meran. The last count, who died in 1335, left one daughter, Margaret Maultasche. She bequeathed her rights to her cousins, the dukes of Austria, who, in consequence, acquired possession of the Tyrol in 1363. The Italian valley formed the bishopric of Trent. During the wars of Napoleon, the German Tyrol was ceded to Bavaria, much to the discontent of the population, who were warmly attached to the house of Austria. They made a gallant resistance to the French in 1809, under Andreas Hofer, but were defeated; and the northern Tyrol was not restored to Austria until the treaty of Paris in 1814. The southern Tyrol, which had been annexed to Italy, was restored to Austria in the following year. An application was

made by the inhabitants of the Italian Tyrol, a few years ago, to the Austrian government to be rendered entirely independent of the German inhabitants of the northern valleys; but it led to no important change in the administration. It showed, however, the desire of the southern Tyrolese to be considered Italians rather than Germans, and it was believed that on the event of a successful war for the recovery of Venice, the whole of the southern Tyrol would be handed over to the kingdom of Italy. This expectation has not been realized. By the treaty of peace between Austria and Italy at the conclusion of the war through which Venetia again became Italian, it is declared that the frontiers of the Venetian provinces ceded to Italy are the administrative frontiers of these provinces under the Austrian rule. Even the shores of lake Garda remained Austrian. How long this arrangement will last, it is hard to predict. The trade of the southern Tyrol is entirely with the south, its wood and cattle being exchanged for the corn of Lombardy, and it is asserted that if any attempt is made to enforce custom-house regulations on the frontier, the inhabitants will not rest satisfied until they have secured the annexation of their territory to Italy.

TYRONE (*Tir-owen*, "Owen's country"), an inland co. of Ulster, Ireland, bounded n. by Londonderry, e. by Armagh and Lough Neagh, s. by Monaghan and Fermanagh, and w. by the last-named county and Donegal. A portion of lough Neagh is assigned by the ordnance survey to this county; and, including this portion, the whole area is 1260 sq.m., or 806,640 acres, of which 450,286 are arable, 311,867 uncultivated, 31,796 under water, 11,981 in plantations, and 710 in towns. The pop. in '71 was 215,766, of whom 119,937 were Roman Catholics, 49,201 Protestants of the Anglican church, 42,156 Presbyterians, and the rest of other denominations. Of the arable land, in 1873 258,150 acres were under crops of various kinds. In the same year the stock amounted to 26,510 horses, 159,858 cattle, 46,083 sheep, and 38,105 pigs. The surface in general is hilly, and often extremely picturesque, this county lying for the most part between the two great mountainous districts which traverse Ulster from e. to west. With the exception of lough Neagh, the lakes, which are numerous, are small. The principal rivers are the Blackwater, the Camowen, and the Ballinderry, of which the two former are navigable. The county is traversed by railways, which connect it with Dublin, Belfast, and the sea-coast at Dundalk. The geological structure is very much diversified. The north-western mountains are chiefly mica-slate, with primitive limestone, and rise in Slieve Sawel to a height of 2,336 feet. Those on the n.e. are of greenstone, with granite and occasional red sandstone. The plain, of which Omagh is the center, is a tertiary formation, with irregular beds of lignite, red marl, and new red sandstone; and between Dungannon and Stewartstown there is a small coal-field, the produce of which is rich, and resembles the coal of Ayrshire. The rest of the plain belongs to the general limestone district. The climate is moist, and the low lands are often flooded. The soil of the plain is a fertile loam; that of the hilly districts sandy, or gravelly. There is a large proportion of bog, the turf of which supplies the chief part of the fuel consumed by the population.

The chief towns are Omagh, Strabane, Dungannon, Cookstown, Aughnacloy, Castlederg, and Clogher, which gives its name to the Episcopal see. Tyrone returns three members to the imperial parliament, two for the county, and one for the borough of Dungannon.

Tyrone was anciently known as the district of Hy-Briun and Hy-Fiachra; and in later Celtic times was called Kinel Eogain, or Tir-owen, whence its modern name. See **ULSTER**.

TYRRELL, a co. in e. North Carolina, bounded on the n. by Albemarle sound; 360 sq.m.; pop. '80, 4,545—4,541 of American birth, 1435 colored. Co. seat, Columbia.

TYRRHENIAN SEA (anc. *Tyrrhenum mare*), that part of the Mediterranean sea (q.v.) between the islands of Corsica, Sardinia, and Sicily on the w., and the Italian peninsula on the east.

TYRTÆUS, famed for his political elegies and marching-songs, was the son of Archembrotus, of Aphidne, in Attica; according to another conjecture he was a Lacedæmonian; while the story which represents him as a lame schoolmaster, of mean family, whom the Athenians (ignorant of his lyric power, and jealous of Lacedæmonian domination in the Peloponnesus) sent to the Lacedæmonians, during the second Messenian war, as the most inefficient commander they could select, must be received as a fiction of later times. He rendered, however, to the Lacedæmonians a kind of assistance which the Athenians little foresaw; and while by his elegies he stilled their dissensions at home, by his war-lyrics he so animated their courage in the field that they were finally triumphant in their conflict with the Messenians, whom they reduced to the condition of helots. This success of his poems Tyrtaeus lived to see, and must accordingly have flourished down to 668 B.C., the last year of the second Messenian war. The best edition of the text of Tyrtaeus is that of Bergk in his *Poetæ Lyrici Græci*.

TYRWHITT, THOMAS, 1730-86; b. England; educated at Oxford. He became under secretary of war in 1756, and clerk of the house of commons in 1762, resigning in 1768. He was appointed a curator of the British museum in 1784. Among his works are *Observations on some Passages in Shakspeare* (1766); and an edition of Chaucer's *Canterbury Tales* (1773-78).

TYTLER, WILLIAM, the author of several literary works of considerable merit, the principal being an *Inquiry, Critical and Historical, into the Evidence against Mary Queen of Scots*, in which it is attempted to vindicate that unhappy princess from the charges brought against her by Robertson and Hume. Tytler was born at Edinburgh in 1711, educated in Edinburgh, admitted a member of the society of writers to the signet in 1742, and died in 1792. He was father of Alexander Fraser Tytler, lord Woodhouselee, and grandfather of Patrick Fraser Tytler, the historian. Tytler was an accomplished musician, and distinguished for his general culture and taste in the fine arts.

TYTLER, ALEXANDER FRASER, a historical writer, and a judge of the court of sessions in Scotland under the title of lord Woodhouselee. He was the eldest son of William Tytler (q.v.), the vindicator of queen Mary, and was born at Edinburgh in 1747, educated principally in Edinburgh, and admitted to the Scottish bar in 1770. He obtained, in 1780, the professorship of history in the university of Edinburgh; in 1790, the office of judge-admiral of Scotland; and in 1802 was raised to the bench of the court of session. His acquirements were of the most varied kind, embracing most departments of literature and the fine arts. His writings include a biography of Henry Home, lord Kames; a Dictionary of Decisions of the Court of Session; and the work by which he is best known, his *Elements of General History*, first published in 1801, which has been translated into most of the languages of Europe, and even into Hindustani. He died in 1813.

TYTLER, PATRICK FRASER, an eminent historical writer, fourth son of Alexander Fraser Tytler, lord Woodhouselee. He was born in 1791, educated partly in Edinburgh, partly in England, and called to the Scottish bar in 1813. Of his various literary and historical works the most valuable is his *History of Scotland*, beginning at the accession of Alexander III., and terminating at the union of the crowns—a book of more critical research than any work on the same subject that had preceded it. His writings also include a life of the admirable Crichton, a life of Wickliffe, a memoir of sir Thomas Craig, and a collection of original letters, illustrative of the reigns of Edward VI. and Mary. In consideration of his merits as a historian, sir Robert Peel's government conferred on him a pension of £200 a year. He died at Malvern Dec. 24, 1849. His talents were such as qualified him in a remarkable degree to shine in society, and his amiable and excellent private character have been the subject of deserved eulogy.—See Burgon's *Life of Patrick Fraser Tytler* (1859).

TZETZES, JOHANNES, a Byzantine (Greek) author, flourished during the latter half of the 12th c., is known as the author of certain works in prose and verse, which, though excessively dull, and without a vestige of literary genius, are valuable as store-houses of classical information, not elsewhere to be had. The principal are—1. *Iliaca*, consisting of three distinct poems, entitled *Ante-Homerica*, *Homerica*, and *Post-Homerica*; or in Greek, *Ta pro Homerou, ta Homerou, kai ta meth' Homerou*; a complete edition of which was first published by Fr. Jacobs (Leip. 1793); but the most critical edition is that of Bekker (Berl. 1816). 2. *Biblos Historike*, more commonly called *Chiliades*, or a collection of more than 600 stories—mythical, legendary, etc.; best edition that of Kiessling (Leip. 1826), written in that worthless sort of verse called *political*, which had regard only to syllables and not to quantity; besides commentaries on Homer, Hesiod, and the *Cassandra* of Lycophron. Several poems and commentaries of Tzetzes exist in MS. that have never yet been published.—Tzetzes had a brother—ISAAC—who probably had some share in the commentary on the *Cassandra*.

TZANA. See DEMBEA, *ante*.

TZAR. See CZAR, *ante*.

TZSCHIRNER, HEINRICH GOTTLIEB, 1778–1828; b. Mittweida, Saxony; studied theology at Leipsic; ordained to the ministry, 1801; professor of theology, Wittenberg, 1805; at Leipsic, 1809; superintendent at Leipsic, 1815; prebendary of Meissen, 1818. He strongly opposed Roman Catholic reaction in Germany. He published *Protestantismus und Katholicismus aus dem Standpunkte der Politik betrachtet*; translated into English, French, and Dutch, *Das Reactionssystem*.

U

U, THE twenty-first letter of the English alphabet, represents in that language three distinct sounds, as heard in *tube*, *tub*, and *full*. The last is its primitive sound, which it had in Latin, and which it has preserved in German and Italian, but which is oftener denoted in English by *oo*. In *tube* it does not mark a pure vowel sound; it is aspirated, as if *y* were prefixed—*tyub*. The sound heard in *tub* is characteristic of English; and, owing, perhaps, to the decided emphasis given to one syllable of a word at the expense of the rest, there is a tendency to allow the other vowels, *a*, *e*, *o*, when unaccented, to degenerate into this indistinct, stifled sound: *cavalry*, *sister*, *fashion* are pronounced almost, if not altogether, as if written *cavulry*, *sistur*, *fashun*. This is especially the case with *o*; and in this vowel the degeneracy is not confined to unac-

cented syllables; in a whole host of words the accented *o* is exactly equivalent to *û*—e.g., *come, money, among*. Perhaps a similar tendency in Latin may account for the prevalence of *u* in that language as compared with Greek—e.g., Lat. *genus* = Gr. *genos*; *volumus* = *boulometha*; *spatula* = *spatale*; *scopulus* = *skopelos*. *U*, in Latin, sometimes goes into the still thinner sound of *i*; thus *maximus, caputis*, degenerated into *marinus, capitis*. Of the labial series of vowels (see LETTERS), *u* approaches nearest to the labial consonants; so much so that in Latin the vowel *u* and the consonant *v* were both denoted by the same character, *v*, of which *u* is only a later modification. In the middle ages the two characters were used indifferently whether as vowel or consonant; and it was only in the 16th c. that the Dutch scholars fixed the use of the character *u* for the vowel, as distinct from *v*.

UBE'DA, a t. of Spain, Andalusia, in the modern province of Jaen, stands on an olive-clad slope in a cultivated plain, 26 m. n.e. of the town of Jaen. It contains some fine specimens of architecture, of which the chief is the cathedral. It was built by the Moors, and under them it is said to have contained 70,000 inhabitants. There are now only 15,000, who are engaged in agriculture, in the manufacture of porous vessels, made of red and white clay, and in trade in the products of the fertile vicinity.

UCAYALI, a great river of South America, one of the chief head-waters of the Amazon. It joins the Amazon from the s., in s. lat. 4° 40', and w. long. 73° 30', opposite the town of Nauta in Ecuador; but the whole course of the river is in Peru. It is the largest river that joins the Amazon above the Brazilian territory, and, on account of its length, has been regarded by some as the main stream of the Amazon, but at its mouth it is not above half the width of the Amazon. The Marañon and Huallaga from the s., with many smaller but still large rivers from the n., have united to form the Amazon. The sources of the Ucayali are in the Andes, Cuzco being situated on one of its feeders, which rises considerably further s.; while another has its rise on the western side of the Andes, to the n.w. of Lima, and after flowing southward for about 150 m., makes its way through a cross valley, and takes a northward course. Attention has of late been very strongly directed to the Ucayali as affording means of communication between the western parts of Peru and the Atlantic ocean. It was partially explored by the count de Castelnau and others in 1846, by lieut. Herndon and Mr. Gibbon of the U. S. navy in 1851, and more recently by an expedition sent out by the Peruvian government. It has been found to be navigable by steamers from its mouth to towns not far distant from Lima, 3,700 m. from the mouth of the Amazon. On the branch which comes from Cuzco there are falls and rapids, which form an impediment to navigation more than 100 m. below that city. The course of the Ucayali is winding, but generally northward. Without regard to any but its principal windings the length of its course is not less than 1100 miles. It receives many large branches. The name Ucayali is not given to any of its head-waters, the chief of which is the Tambo, formed by the junction of the Mantaro, a river which has its sources to the n.w. of Lima, and the Apurimac, which comes from a more southern region. The greater part of the country through which the Ucayali flows is covered with forest; but it seems very suitable for colonization, if easy communication with the rest of the world were established, the soil being fertile, while the mountains abound in valuable minerals.

UCHEES, a tribe of American Indians, inhabiting the shores of the Savannah river as far s. as its confluence with the Ogeechee. During the troubles which culminated in the Yemassee war, they moved to the Chattahoochee country, and as members of the Creek confederacy were given a reservation in the Indian territory, retaining their original language and customs.

UDALL, or **WOODALL**, **NICHOLAS**, 1504-56; b. England; graduated at, and fellow of Corpus Christi college, Oxford; was zealous for the reformation; master of Eton, 1534-43, noted for severe discipline, and dismissed for removing silver images from the chapel; vicar of Braintree; rector of Calbern; canon of Windsor, 1551-56; he d. master of Westminster, 1555. He wrote several Latin and English plays to be performed by his pupils, one of which, *Ralph Roister Doister*, is the earliest English comedy known to be extant, being identified as such by a quotation from it in *Wilson's Logic*, 1551. He was also the author of some other poems and of several school books.

UDAL RIGHT, in the law of Scotland, means that right in land which may be completed without charter and sasine by undisturbed possession provable by witnesses before an inquest. Though dependent on the crown as superior, the vassal pays only a tribute called *skat*. The right is said to have been the old tenure prevalent in Britain before the feudal system was introduced, and prevails chiefly in Orkney and Shetland. The lands held on udal right are now commonly converted into feus.

UDINE, a province of Venetia in n.e. Italy, adjoining Austria and lying on the Adriatic sea; 2,515 sq.m.; pop. '72. 481,586; drained by the Tagliamento and lesser rivers. The surface is low and marshy in the s., but rugged in the n.; the chief occupation is the production of silk, of which large quantities are exported.

UDINE, a city of n. Italy, Venetia, in the province of the same name, formerly called also the province of Friuli, situated in a fertile plain, about 75 m. n.e. of Venice by railway. It is a walled town, 4 m. in circumference, with wide, handsome streets and

squares. The castle, which stands on a hill in the midst of the city, was formerly the residence of the patriarchs of Aquileia, and is now the seat of the tribunals. The Antonini palace is a work of the architect Palladius. Udine trades in silk, in copper utensils, and rosolio. There are leather, paper, and silk factories. Pop. '72, 29,630. Two miles from Udine stands the village of Campofornio, where, in 1797, the treaty between Bonaparte and Austria was signed, by which Venice was ceded to the latter. Pop. of prov., '71, 481,586.

UEBERWEG, FRIEDRICH, b. Prussia, 1826; educated at Göttingen and Berlin, and in 1862 was made professor of philosophy at Königsberg. He has written a work on logic, and a standard history of philosophy, translated in America by prof. G. S. Morris.

UFA, a government of Russia, formed in 1865 out of the five n.w. districts of Orenburg, and separated from the present government of Orenburg by the s.w. branch of the Ural mountains. Pop. '70, 1,364,925. See ORENBURG.

UFA, capital of the government of the same name, on the right bank of the Biëlaia, or White river. It was built in 1573, in the reign of Ivan IV. It contains 12 churches and 24 manufactories, the principal articles of trade being honey, wax, fat, furs, and skins. The Biëlaia, an affluent of the Kama, and thus connected with the Volga, is here navigable for large ships. Pop. '67, 20,166.

UGANDA, a narrow strip of land in central Africa, on the n. and n.w. shores of the Nyanza, or Victoria lake, bounded s. by the Kagera river, e. by the Nile; the n. and w. boundaries not clearly defined. The portion along the coast, and for some distance inland, is mountainous, and the banks of the Nyanza are covered with magnificent forests; in the interior are extensive valleys with groves of wild date palms and gigantic grasses. The coast region is very fertile, owing to the mild climate, and the constant showers of rain, which fall in every month of the year; and is capable of growing nearly all European plants and fruits. The government is an absolute monarchy though the king is controlled to some extent by the chiefs. The three leading chiefs choose his successor, who is generally one of the youngest of the late king's sons. The people are more civilized than they were at the visit of Speke and Grant. Several of the chiefs can read and write Arabic. Their religious ideas are crude. They have one God, the Creator, but they have others to which they pray and make offerings.

UGLITCH, a t. of great Russia, in the government of Jaroslav, on the right bank of the Volga, 488 m. s.e. of St. Petersburg. In early times, it was the chief town of an independent principality of the same name. After the assassination at Uglitch of prince Dmitri, son of Ivan IV., in 1592, the majority of the inhabitants of the town were banished to Siberia and other distant quarters, and the town, formerly prosperous, became deserted. Uglitch contains 24 churches, 2 cloisters, and 14 manufactories—linen, weaving, and tanning being the principal branches of industry. Pop. '67, 13,272.

UGOCSA, a co. in n.e. Hungary, in the trans-Tibiscan circle; 460 sq.m.; pop. about 67,498. Capital, Nagy-Szöllös.

UGOLINO DELLA GHERARDESCA, Count, an Italian nobleman of the 13th c., chiefly known for his cruel death, which Dante has immortalized in his *Inferno*. Ugolino was for a time the head of the party of the Guelphs at Pisa, but a conspiracy, led by arch-bishop Ubal dini, a Ghibeline leader, was formed against him, and with his sons and grandsons he was cast into the tower of Gaulandi, and left to perish miserably by starvation.

UGRIANS, a Finnish people living in the district of Tobolsk, Siberia. They live a wandering life, supporting themselves by fishing and the chase. Though professedly Christians, their religious belief is a cross between Christianity, Shamanism, and Mohammedanism. Their language is a Finnic dialect.

UHLAND, JOH. LUDWIG, a celebrated German poet, was born at Tübingen, April 26, 1787, studied at the university of his native city, and first appeared as a writer of verse in Seckendorf's *Musen-almanach* (1806-7). For several years he continued to publish ballads and other lyrics in various periodicals, the first collection of which, under the title of *Gedichte*, appeared in 1815. To this he kept adding all the rest of his life, and it is on these *Gedichte* that his fame rests. Their popularity has been, and continues to be, as great as it is merited, upward of a dozen editions having been published. Other productions of Uhland's are his admirable essays, *Ueber Walther von der Vogelweide* (Stuttg. 1822), and *Ueber den Mythos der nord. Sagenlehre vom Thor* (Stuttg. 1836); a masterly collection of old popular songs (*Alter hoch und niederdeutscher Volkslieder* (Stuttg. 1844-45); and two dramas, *Herzog Ernst Von Schwaben* (Heidelb. 1817), and *Ludwig der Baier* (Berl. 1819). He died at Tübingen, Nov. 13, 1862. Uhland was a patriotic politician as well as a poet. He entered the representative assembly of Würtemberg in 1819 as a deputy from Tübingen, and proved an active member of the liberal party. He was also a delegate to the Frankfurt assembly of 1848; but though Germany has reason to be grateful for his services to the cause of constitutional liberty, it is as a poet he will be best remembered. His pieces are full of

spirit, imagination, and truth, finely picturesque in their sketches of nature and exquisite in their varied tones of feeling. Nothing, indeed, can surpass the brevity, vigor, and suggestive beauty of his ballads, in which a romantic sweetness of sentiment and a classic purity of style are happily combined. Uhland is the acknowledged head of the "Suabian school" of German poets. See Pfizer's *Uhland and Rückert* (Statt. 1837), and Mayer's *Uhland* (1867). Longfellow has translated some of Uhland's ballads, in his *Hyperion*, into English; and translations by Platt, Skeat, and Sanders have also appeared.

UHLANS (a Polish word signifying "lancers"), light cavalry of Asiatic origin, were introduced into the n. of Europe along with the colonies of Tartars who established themselves in Poland and Lithuania. They were mounted on light active Tartar horses, and armed with saber, lance, and latterly with pistols. Their lance was from 5½ to 6½ ft. in length, and, like that of the modern "lancers," was attached to a stout leather thong or cord, which was fastened to the left shoulder and passed around behind the back, so as to allow the lance to be couched under the right arm. Immediately below its point was attached a strip of gaudy-colored cloth, the fluttering of which was designed to frighten the enemies' horses. The early dress was similar to that of the Turks, and the regiments, or *polks*, were distinguished from each other by the red, green, yellow, or blue color of their uniforms. The Austrians and Prussians were the first to borrow this species of cavalry from the Poles. In 1734, an attempt was made by marshal Saxe to introduce the uhlans into France, and a "polk" of 1000 men was formed; but it was disbanded at its author's death. The Prussian uhlans won great renown in the Franco-German war of 1870-71 by their bravery and marvelous activity. The Prussians applied the term, however, rather loosely, including all their light cavalry under the designation.

UINTAH, a co. in w. Wyoming, containing Fremont's peak, the greater part of the Yellowstone national park, and the Uintah mountains; 13,500 sq.m.; pop. '80, 2,879—1748 of American birth, 411 colored. The direction of the Uintah range is nearly e. and west. It is composed of broad plateau like masses carved into integral blocks or subdivided into many parts. The rocks are quartzites, sandstones, carboniferous limestones, etc. They continue over the border of Utah from the Wahsatch range. Among the highest peaks are Dawes peak 13,000 ft. above tide-water, Cox's peak, and Logan's peak. Co. seat, Evanston.

UIST, NORTH AND SOUTH, two islands of the outer Hebrides, are situated from 15 to 18 m. w. of the isle of Skye, from which they are separated by the little Minch. Unlike the other islands of the Hebrides, the e. coasts of North and South Uist are much and deeply indented, while the w. coasts are, as a rule, almost unbroken.—**NORTH UIST**, between which and *South Uist* the island of Benbecula intervenes, is 18 m. long from w. to e., and from 10 to 3 m. in breadth. The eastern half of it is so cut up by lochs and water-courses as to have the appearance of an archipelago. This region is a brown, peaty, dreary bog, partly relieved, however, by a line of low hills running along the coast at the distance of about 2½ miles. In the w. part, which, as a rule, is hilly, there is a tract of uneven, low land, exceedingly beautiful in certain seasons, rendered fertile by the drifting of shell-sand from the coast, and producing good clover and grain crops. Pop. '71, 3,222.—**SOUTH UIST**, 20 m. long, and 7 m. broad. Its e. coast is much indented by the lochs Skipport, Eynort, and Boisdale. The eastern district is upland; the western is alluvial and productive, under proper treatment. Pop. '71, 3,669, engaged, like the inhabitants of North Uist, in fishing and agriculture.

UJEIN', one of the seven sacred cities of Hindustan, in India's dominions, of which it was formerly capital, stands on the right bank of the Sipra, 35 m. n.n.w. of Indore. It is surrounded by walls with round towers, is six m. in circumference, contains the grand palace of the head of the Sindia family, several mosques and mausoleums, an observatory, and an antique gate, supposed to date from before the Christian era. An active trade is carried on in cloths, opium, etc. The number of the inhabitants is not ascertained.

UJHELY-SATORAL'YA, or **SATORALYA-UJHELY**, a market-t. of Hungary, 105 m. n.w. of Pesth. It stands on the Hegyalya mountains, contains several churches and a gymnasium, and is noted for its wine-culture. Pop. '69, 9,946.

UJJIJI, a t. in Africa, capital of a small region of the same name, on the e. shore of lake Tanganyika; pop. 3,000. It is divided into two parts, Ugyi inhabited by Arabs, and Kawélé, by the natives. Here Stanley found Livingstone, Nov. 10, 1871.

UKASE', or **UKAS** (Russian *ukasat*, to speak), a term applied in Russia to all the orders or edicts, legislative or administrative, emanating from the government. The ukases either proceed directly from the emperor, and are then called *imenny ukas*, or are published as decisions of the directing senate. Both have the force of laws till they are annulled by subsequent decisions. Many ukases are issued in the course of one reign; and as an immense chaos of ukases had accumulated since 1649 (the date of the last codification of laws), the czar Nicholas ordered (1827) that a collation of them should be made. The result was a collection of laws in 48 volumes, which has been supplemented year by year by volumes of new ukases, and which, after the elimination

of such ukases as are unimportant or of temporary authority, constitutes the present legal code (*statut*) of the Russian empire. The *prukases* are imperial "orders for the day," or military orders given during the campaign.

UKRAINE (Slav. a frontier country or march), the name given in Poland first to the frontiers toward the Tartars and other nomads, and then to the fertile regions lying on both sides of the middle Dnieper, without any very definite limits. The Ukraine was long a bone of contention between Poland and Russia. About 1686 the part on the e. side of the Dnieper was ceded to Russia (Russian Ukraine); and at the second partition of Poland the western portion (Polish Ukraine) also fell to Russia, and is mostly comprised in the government of Kiev. The historic Ukraine forms the greater part of what is called little Russia (a name which first appears about 1654), which is made up of the governments of Kiev, Tchernigov, Poltava, and Kharkov.

ULCERATION is "that part or effect of an inflammatory process in which the materials of inflamed tissues liquefy or degenerate, are cast off in solution or very minute particles from free surfaces, or, more rarely, are absorbed from the substance of the body."—Paget on "Ulcers," in Holmes's *System of Surgery*, vol. i. p. 197. Generally speaking, however, the name of ulcer is not applied to any inflammatory result, unless the substance of a tissue deeper than the epithelial is exposed; and when the cast-off particles are only epithelial, the result is termed desquamation, abrasion, or excoriation, although the process may be essentially the same. Ulceration is closely allied to gangrene, the two processes differing in degree rather than in kind. "When the degenerate or dead substance," says sir J. Paget, "is cast off in one or more portions visible to the naked eye, the process is usually called gangrene; when the portions are not so visible, or are quite dissolved, it is called ulceration." The degenerate tissues are always suspended or dissolved in a liquid, termed the "discharge," or "ichor," which varies in appearance and properties according to the cause and characters of the ulcerative process. "From some ulcers, e.g., the primary syphilitic, it is contagious; from many, it appears corrosive, exciting by its acridity inflammatory changes in the tissues with which it is in contact."

ULCERS (derived from the Latin *ulcus*, a wound) may be arranged either according to the constitutional or specific disease from which they are derived, or according to the characters which they present. According to the first system, we speak of ulcers as healthy, inflammatory, strumous, etc.; while, according to the second, they are named irritable, chronic, sloughing, etc. In this article, we shall adopt the former of these arrangements, as being, upon the whole, the most satisfactory, although each possesses its own advantages.

A *common, simple or healthy ulcer* is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface, tending to cicatrization. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the border is of a purplish blue tint where the young epidermis modifies the color of the healing granulations; and within this, the granulations have a deeper hue than those at the center, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is healthy or "laudable" pus. The only treatment required is a little dry lint, if there is much discharge; or the water-dressing, if the sore is comparatively dry. When the granulations are too luxuriant, they must be touched with nitrate of silver, and dressed with dry lint. *Inflammatory ulcers* differ less than most kinds from the above-described common or healthy ulcers. They commonly arise from some trifling injury, such as a blow or slight abrasion of the skin, which, to a healthy person, would have done no harm. Their most common seat is on the lower half of the leg or shin. The surface is red, and bleeds easily; the discharge is thin and watery; the edges irregular or shreddy; and the surrounding skin shows a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-fed and overworked. Hence constitutional treatment, good diet, and complete rest (with elevation of the limb) are here demanded, in addition to water-dressing or lead-lotion applied warm. *Senile ulcers* usually present very little discharge, exhibit granulations of a rusty red tint, and are surrounded by a dusky red area. Nourishing food, wine, bark and the mineral acids are here required, and opium in small repeated doses is often serviceable. The local treatment must be of a stimulating nature; and in bad cases sir J. Paget recommends strapping the leg daily with a mixture of resin ointment and Peruvian balsam spread on strips of lint. *Strumous or scrofulous ulcers* usually occur as the consequence of scrofulous inflammation in the subcutaneous tissue or lymphatic glands. They most commonly occur in the neck, groins, cheeks, scalp, and the neighborhood of the larger joints. The discharge is thin, and of a greenish-yellow tint. These ulcers are seldom very sensitive or painful. The general treatment must be that recommended for constitutional scrofula (q.v.). Iodine, in some form or other, is the best local application. A poultice of bruised and warmed sea-weed is a very popular remedy; but there is probably nothing so efficacious as tincture of iodine diluted with water till it causes only a slight discomfort, and applied three or four times a day. (About 30 drops of the tincture may be added to an ounce of water to begin with.) Of the numerous other species distinguished by sir J. Paget, we shall briefly notice the

varicose, indolent, and sloughing ulcer. *Varicose ulcers* are connected with an enlarged or varicose state of the veins of the lower extremity, which weakens the parts, and renders them especially liable to ulceration. See **VARICOSE VEINS**. The *chronic, indolent, or callous ulcer*, beyond all doubt, gives more trouble to the poor-law medical officer and the workhouse surgeon than any other half-dozen surgical affections. It is usually seated in the lower half of the leg, and is most commonly of an oval form, with its long axis parallel to that of the leg. "Its base lies deep, and is flat, pale, or tawny and dusky, with very minute or no visible granulations. The margin is usually abrupt, or unequally shelving, and in its most characteristic form, strictly overlaid with opaque, white, dense epidermis."—Paget, *op. cit.*, p. 217. Many volumes have been written on the proper means of treating this form of ulcer. The distinguished surgeon from whose memoir we have so largely quoted, especially recommends opium, regulated pressure, and blistering. A grain of opium night and morning is usually sufficient. The pressure is applied with straps of adhesive or lead plaster on linen. The object of blistering is not only to stimulate the ulcer, but to soften its callous edges by causing absorption of part of the exudation with which they are infiltrated, and desquamation of the cuticle which covers them. The expediency of healing old ulcers of this kind has often been called in question, inasmuch as apoplexy, palsy, mania, and other serious diseases are said to have followed the healing of such ulcers. In the following cases it may be decided that a cure should not be attempted. (1) If the ulcer be affected by the gout, having regular attacks of pain, returning at stated periods, and similar to what the patient has experienced from gout in other parts. (2) If an ulcer habitually occur whenever the constitution is disordered. (3) If the patient be very infirm and old; for under these circumstances the removal of a habitual source of irritation, or the diversion of a habitual efflux of blood may prove fatal; and especially as very old ulcers have been known to heal spontaneously a short time before death. To these cases, specified by sir E. Home, Dr. Druitt adds (4) that of ulcers on the legs of stout women about the critical period of life, and displaying a tendency to discharge profusely as the menstrual discharge diminishes. To counteract these dangerous tendencies, the bowels should be freely purged during, and for some time after, the cure of an old ulcer; and if there any symptoms of congestion in the head, a seton should be inserted in the back of the neck.

For the treatment of *sloughing ulcers*, we must refer to the article **SYPHILIS**.

ULEABORG, a län of n. Finland in Russia, bounded by Norway and Sweden, containing lake Enare; 63,955 sq.m.; pop. '72, 185,890. Capital, Uleaborg.

ULEABORG, a sea-port t. of Russian Finland, capital of the government of the same name, stands on the s. bank of the Ulea, on the eastern shore and near the head of the gulf of Bothnia. It was founded in 1605, and the privileges of a port were granted to it in 1715. In 1822 it suffered severely from fire. The harbor has of late years become so shallow, that vessels are obliged to unload in the roadstead, 4 m. from the town. Pop. '67, 7,602, who are engaged in the dockyards, sawmills, and breweries of the town. In 1854, an English flotilla burnt the government property in the place.

ULEMA, the collective name of a certain class of theological jurists in Turkey, who, as is the case in Mohammedan countries, derive their decisions from the Koran and its commentaries. The ulema enjoys many privileges; he pays no taxes, cannot be condemned to death or deprived of his property by any court of law. He can only—eventually—be deposed and banished. The ulemas have to recognize, save their two immediate superiors (the *kadiaskers* or *kadilesks*), only the mufti as their chief authority, while they are the superiors of all the mollahs (q.v.) in the different provinces. The kadi forms the lowest judicial class, and are subject to the mollahs in every respect.

ULEX. See **FURZE**.

ULFILAS (*Ulphilas*, *wulfilas* = little wolf), the celebrated translator of the Bible into Gothic, was born about 318 A.D., of Marcomannian parents, n. of the Danube, among a Gothic population. Consecrated bishop in 348, he was expelled by his heathen compatriots from his native place, and sought refuge, together with a number of newly-converted Christians, in lower Mæsia, at the foot of the Hæmus, where he remained for thirty years. In 388 he went to Constantinople (whither he had gone once before to assist at a council, in 360), and died there shortly afterward. He was one of the chief lights of Arianism (see **ARIUS**), in the interest of which he exerted himself with the utmost energy. Nor was his political influence less felt among his Gothic countrymen; and the contemporaneous Greek historians, no less than those that followed within a short time after his death, are unanimous in attributing to him the largest share in the religious and social development of the Gothic population. His greatest work, however—one which will render his name famous for all ages—is his Gothic translation of the Bible, a work by which he contrived both to fix the Gothic language and to perpetuate Christianity among the Gothic people. Familiar with Latin, Greek, and Gothic, and accustomed to write in each of them, he undertook to render the whole Bible, with the exception of the two warlike books of Samuel and Kings—the influence of which he feared for his easily inflammable people—into a language which till then had, as far as we know, never been used for any literary composition of importance. Up to the 9th c., this sacred and national work accompanied the Goths in "their migrations."

But from that period forth, nothing was known of it beyond what was found stated in the ancient ecclesiastical accounts. It was not till the end of the 16th c. that Arnold Mercator discovered in the abbey of Werden the four Gospels of Ulphilas. Thence it found its way to Prague, where it remained till 1648, when the Swedes took it as a spoil to Upsal, where it still remains in the university library, under the name of the *Codex Argenteus*. In 1818, further remnants of the work—a great portion of the letters of St. Paul—were discovered by A. Mai and Castiglioni, on palimpsests, in a Lombardian monastery, which, added to a few minor fragments, bring the New Testament somewhat near completion. But hardly anything—save a few passages from Ezra and Nehemiah—has survived of the Old Testament. The immense importance of this sole Gothic remnant for Teutonic philology cannot well be overrated. It is principally through it that the wonderfully fine structure of Gothic—a Germanic dialect of surpassing wealth and purity—has become known.

ULIASUTAI, a city in Mongolia, lying between the Russian frontier and the capital of Shen-shee, Si-Ngan-Foo. The inhabitants are partly Chinese and partly Mongolians. The place is important as a distributing station for the markets of Central Asia.

ULLMANN, KARL, 1796-1865, b. Bavaria; studied theology at Heidelberg and Tübingen; was a friend of Hegel, Daub, and Schleiermacher; appointed professor at Heidelberg in 1821, simultaneously with Neander and Schleiermacher; in connection with Umbreit established in 1828 the Protestant quarterly review, *Studien und Kritiken*, for which he wrote able essays afterward separately published; professor at Halle, 1829-36; after which he returned to Heidelberg; bishop of state church in Baden, 1853, and president of its supreme ecclesiastical council, 1856-60. Among his published writings are, *Gregory Nazianzen; History or Myth? The Worship of Genius; Sinless Character of Jesus; Reformers Before the Reformation*.

ULLO'A, ANTONIO DE, 1716-95, b. Spain; entered the Spanish navy in which he became lieutenant in 1735. The same year he accompanied to South America the French scientific expedition sent out to measure a degree of the meridian at the equator. In 1744 he was captured on his way to Europe, imprisoned in England, but released at the instance of his scientific friends. He came to Louisiana as its governor in 1766, but was forced to leave on account of an insurrection. Afterward put in command of a fleet which was to take a British merchant fleet near the Azores, and then to proceed to Havana, and join an expedition against Florida. He neglected to open his sealed orders and was tried by court martial in 1780, and acquitted. He did not, however, again enter the service.

ULLSWATER, after Windermere, the largest of the English "lakes," lies between the counties of Cumberland and Westmoreland, 10 m. e. of Keswick. Length, 9 m.; breadth, 1 mile. Its scenery has none of the soft beauty of that of Windermere, but is rugged and grand. One of the chief features of the landscape is the lofty mountain Helvellyn, which rises from the s.w. extremity of the lake.

ULM, the second city of Württemberg, in 49° 54' n. lat., and 8° 8' e. long., was, till the war in 1866, a stronghold of the Germanic confederation, garrisoned by troops of Württemberg, Austria, and Bavaria. It was long one of the most important imperial free cities. Ulm is situated at the junction of the Blau with the Danube, which then becomes navigable, 53 m. w. of Augsburg by railway. Two bridges unite the city with New Ulm, a village on the Bavarian side of the river. The streets are narrow, and the buildings old. Pop. '71, 26,290; '75, 20,222. The environs of Ulm are flat. The cathedral, which is a Protestant church, is remarkable for architectural beauty, and is, next to the cathedral of Cologne, the largest church in Germany. It is 475 ft. in length, 165 ft. in breadth, and 140 ft. in height, the unfinished tower over the main entrance being 320 feet. The building was begun in 1377, and finished in 1494. There are good schools for the people, a gymnasium, high school, and trades' school, a public library, an agricultural society, and many charitable institutions. Leading industries are weaving linen, cotton, woolen, and mixed fabrics; bleaching; making paper, leather; beer-brewing, ship-building, book-printing, etc. Ulm is famed for ornamental pipe-bowls, and pastry called Ulmer bread. Around the city, gardening is extensively carried on, and asparagus especially cultivated.

The Romans had a settlement at this important point. In 1531, the city accepted the reformation, and the majority of the people have since been Lutherans. In 1802, Ulm was attached to Bavaria, and became part of Württemberg in 1810.

ULMA CÆ, a natural order of exogenous plants, regarded by some botanists as a sub-order of *urticaceæ*. They are trees or shrubs, having rough alternate leaves, each leaf with a pair of deciduous stipules. The flowers are small and in loose clusters. The perianth is small, membranous, bell-shaped, irregular; the stamens equal in number to the lobes of the perianth, and inserted into their base; the ovary superior. The fruit is 1-2 celled, nut-like, or compressed and winged. There are about 60 known species, natives of temperate parts of the northern hemisphere. See **ELM**, **NETTLE TREE**, and **ZELKOUA**.

ULMIN. See **HUMUS**.

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ULNA. See ARM.

ULODENDRON, a singular genus of coal-plants, founded on stems which occur chiefly in the roof-shales. The stems are covered with small rhomboidal scars, as in *lepidodendron*, formed by the bases of leaves or scales; but they differ remarkably from that genus in having a double series of large oval or circular markings, arranged linearly on the opposite sides of the trunk. These markings are variously interpreted as representing the cicatrices produced by the bases of cones, by branches, or by leaf-stalks. It is, like many of the coal fossils, an extremely enigmatical plant; and it is difficult to determine its position in the vegetable kingdom. It is probably an ally of *lepidodendron*, and that is known to be a vascular cryptogam nearly related to *lycopodium*. Seven species are known.

ULPIANUS, DOMITIUS, a celebrated Roman jurist, of Tyrian extraction, flourished in the early part of the 3d century. The exact date of his birth, however, is unknown. He appears to have held juridical offices during the reign of Septimius Severus and Caracalla, of which he was deprived by Elagabalus; but on the accession of Alexander Severus (222 A.D.), he became the principal adviser of the emperor, who appointed him *scriniorum magister* (keeper of the public records), a *consiliarius* (public assessor), and *prefectus annonæ* (superintendent of the corn-market). He also held during the reign of Alexander Severus the important post of prefect of the prætorian guards, though it is uncertain whether that monarch first conferred it upon him. He was murdered by his own soldiery, 228 A.D. Ulpianus was both a voluminous and a valuable writer. In the *Digest* of Justinian, there are no fewer than 2,462 excerpts from him, many of which are of considerable length. Altogether they form about a third of the whole body of the *Digest*. Unfortunately the originals have almost entirely perished. The principal were—*Ad Edictum* (83 books), *Ad Sabinum* (51 books), *Ad Leges Juliam et Papiam* (20 books). The so-called *Fragmenta* of Ulpianus (first published at Paris by Tilius in 1549) consists of 29 titles, whence they are called in the vatican MS. *Tituli ex Corpore Ulpiani*. The best edition is Böcking's (Bonn, 1836).

ULRIC, ST., Bishop of Augsburg, and venerated as one of the fathers of the German church, was b. at Augsburg about the year 890. His father, Hupald, was one of those counts of Dillingen who play so important a part in mediæval German history, and Ulric himself owed part at least of the extraordinary influence which he exercised in his time to the distinguished rank of his family. He was educated in the celebrated Benedictine monastery of St. Gall (q.v.) in Switzerland, but his later life, and the character of his mind, as well as the tendency of his religious views, appear to have been influenced less by his monastic instructors, than by the counsels of a remarkable female recluse named Wiborada, whose cell was in the vicinity of St. Gall, and with whom he formed a close association. It was by her counsel that, instead of adopting the Benedictine habit at St. Gall, he devoted himself to the secular ministry, and returned to his native diocese of Augsburg, where he received holy orders. In accordance with the usage of his time, he made a pilgrimage to Rome, and soon after his return, was consecrated bishop of Augsburg, on the death of Hilte in the year 923. The details of his history as administrator of this church, which had suffered serious disorganization through the Magyar invasion and other wars, would be out of place here; but they are related with much circumstantiality by his contemporary biographer; and they throw so much light as well on the externals of the religious life of the time, as on the moral and spiritual character of the people, that, as well as clergy, as to merit the most serious consideration of every student of mediæval history. Bishop Ulric bore an important part in the public affairs of the empire during the reign of Henry I. and his son Otho; and he was the guiding spirit of the several councils in Germany which, in the 10th c., labored at the work of reformation. He died in 973.—See the ancient *Vita S. Oudalrici Episcopi*, which is edited by Mabillon, by the Bollandists, and recently by Dr. Pertz. Some letters and sermons, still extant, have been ascribed to Ulric, but they are regarded as spurious by Mabillon and Pertz, as well as by the Bollandists.—See Braun's *Geschichte der Bischöfe von Augsburg*.

ULRICI, HERMANN, a German philosopher, b. at Pförten in lower Lusatia, Mar. 23, 1806, studied at Halle and Berlin, and after a brief career as a lawyer, devoted himself exclusively to literature and philosophy. In 1834 he was appointed a professor-extraordinary at Halle, where he still occupies a chair. His first work was his *Geschichte der Hellenischen Dichtkunst* (1835), which was followed by a very ingenious essay on the dramatic art of Shakespeare (*Ueber Shakespeare's dramatische Kunst*, 1839; Eng. transl., 1846). Other works of Ulrici's are his *Ueber Princip und Methode der Hegel'schen Philosophie* (1841); *Das Grundprincip der Philosophie* (1845-46); a *System der Logik* (1852); *Gott und die Natur* (1862; 2d ed., 1866), *Gott und der Mensch* (1866), in which Ulrici develops a system of theistic philosophy, in opposition to materialism and anæthetical pantheistic speculation. Further Shakespearian studies we have in *Romeo und Julia*, and a *Geschichte Shakespeare's und seiner Dichtung* (1867).

ULSTER (Lat. *Ultonia*), a province of Ireland, the most northern of the four provinces which compose that kingdom (see IRELAND), is divided into nine counties—Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone, each of which is described under its proper head.

The territorial distribution under which Ulster formed a province, or at least a distinct territory, is of very ancient origin. It formed one of the five ancient divisions of Ireland, and was the seat of the Hy-Nials or O'Neills, as well as of the lesser septs of O'Donnell, O'Cahan, O'Doherty, Maguire, MacMahon, etc. The north-eastern portion, now the county of Down, was early overrun by John de Courcy, and subsequently by Hugh de Lacy, and was the most permanent seat of English power in the north. The Antrim coast was occupied by a Celtic colony from Scotland and the Isles; but although various efforts were made by the English to effect a permanent settlement in the n. and n.w., the success was but nominal until the reigns of Elizabeth and of James I., when the plantation of Ulster was effected. Of this gigantic scheme of colonization, the chief seat was the county of Londonderry (q.v.). In Ulster, the Celtic race, owing to the frequent and large infusions of a foreign element, is found in a much smaller proportion. In 1861 the Roman Catholics were slightly in excess of the total of all other denominations, the whole pop. being 1,910,108, and the Roman Catholics numbering 963,687. These proportions, owing to 10 years' emigration, are reversed in the returns of 1871. Of the total pop. in 1871, 1,833,228, the Protestants of all denominations made up 935,988; the Roman Catholics only 897,230. Of the former, the greater number, viz., 477,729, were Presbyterians, 393,268 belonged to the Episcopalian church, and the rest were Protestants of other denominations.

ULSTER, a co. in s.e. New York, having the Hudson river for its e. boundary; 1150 sq.m.; pop.'80, 85,838—75,507 of American birth, 1373 colored. It contains the Catskill mountains in the n.w., the Shawangunk mountains in the s., and lake Mohonk. Co. seat, Kingston.

ULSTER BADGE. On the institution of the order of baronets in England by James I., a sinister hand, erect, open, and couped at the wrist gules, the armorial ensign of the province of Ulster, was made their distinguishing badge, in respect of the order having been intended for the encouragement of plantations in the province of Ulster. This badge is sometimes borne in a canton, sometimes on an escutcheon, the latter placed either in the fess point or in the middle chief point, so as to interfere as little as possible with the charges of the shield.

ULSTER KING-OF-ARMS, the king-of-arms or chief heraldic officer of Ireland. A king-of-arms called Ireland existed in the time of Richard II., but the office seems to have fallen into abeyance in the following century. Ulster was created to supply his place by letters-patent of Edward VI. in 1552. Ulster holds his appointment from the crown, and acts under the immediate direction of the lord-lieutenant of Ireland. His office is in the record tower of Dublin castle; and the professional staff under him consists of two heralds, four pursuivants, one registrar, and one clerk of records. The records of Ulster's office comprise pedigrees of the nobility and gentry of Ireland, certificates of their deaths and funerals, and grants of arms. The official arms of Ulster King-of-arms are: Argent, St. George's cross gules, on a chief of the last a lion passant gardant between a harp and a portcullis or.

ULTIMA TUM, in diplomacy, the final conditions or terms offered by one government for the settlement of its disputes with another; the most favorable terms which a negotiator is prepared to offer, whose rejection will generally be considered to put an end to negotiation.

ULTIMUS HERES, in the law of Scotland, means the crown, which is the last heir after all the kin have become exhausted, and succeeds to the property of those who die without leaving next of kin, or who, being bastards, have no next of kin.

ULTRAMARINE, a beautiful blue pigment, formerly obtained only from the very valuable mineral, lapis-lazuli; but an artificial kind is now made so cheaply, and is so good, that it is generally used instead. The true ultramarine, from its costly nature, was only used by artists; the artificial sort is, however, extensively used by house and ship painters, and is as cheap as it is beautiful. Many artists still insist upon having the former kind, which is prepared as follows: Fine lapis-lazuli is broken up into very small pieces, so as to enable the operator to see and pick out the small white portions which occur in it. Of the pieces of pure blue which remain, a pound weight is then taken, and in a carefully covered crucible, is heated to redness, and then thrown into cold water. It is next reduced to an impalpable powder, and mixed with 6 oz. of finely powdered resin, as light in color as it can be obtained, and 2 oz. each of spirits of turpentine, bees-wax, and linseed oil, all previously melted together. When these ingredients are thoroughly worked into a mass, portions of it are taken and kneaded in clean water; as long as any blue color is given out, this is continued, until every portion has been so treated. The blue water is then allowed to rest, and the sediment is collected and washed in water several times. The first washing removes a considerable quantity of dirt and other foreign matters, and is consequently rejected. The second, after being well agitated, is decanted; and from it is obtained the highest quality of the pigment. That which remains usually has two other washings, each of which gives a product of a less value than the operation which preceded it. The product obtained by sediment from each of the waters used is carefully dried, and is then employed either to make cakes for water-color painting, or a mixture for oil-painting, the value being about £1

per ounce. **ARTIFICIAL ULTRAMARINE.**—The French chemists Clement and Desormes, in studying the curious process of obtaining ultramarine from lapis-lazuli by mixing it with resin, etc., were led to an analysis of the coloring matter that suggested to Guimet the idea of composing it artificially. In this he succeeded, and obtained for his discovery the prize of 6,000 francs offered by the *Société d'Encouragement des Arts*. Almost simultaneously, Gmelin in Tübingen gave an analysis and a synthetic process which also succeeded, and artificial ultramarine is now a regular article of manufacture. Chemical skill, however, is necessary to success, and the manufacturers' formulas are very various—differing in the quantities of the ingredients, and the order of mixing them. The German manufacturers are very successful, and some of them have recently produced a fine green ultramarine. The following formula is one of the simplest: 100 parts of finely-washed kaolin or porcelain clay (silicate of alumina), 100 of carbonate of soda, 60 of sulphur, and 12 of charcoal are mixed and exposed in a covered crucible to a bright heat for 3½ hours, when a green, unfused residue should be left. This residue, after being well washed and dried, must be mixed with a fifth of its weight of sulphur, and exposed in a thin layer to a gentle heat, so as just to burn off the sulphur. When this is accomplished, more sulphur must be added, and the washing repeated; and so on, until the mass acquires a light blue color, which is usually the case after the third roasting. In 1872, however, Fürstenau introduced improvements into the manufacture of ultramarine, showing how the blue tint could be produced in one calcination. There is reason to believe, from the experiments of Wilkens, that ultramarine is composed of two portions—one of which is constant in its composition, and is the essential coloring matter, containing about 40 of silicic acid, 26 of alumina, 13 of sulphur, and 21 of soda, arranged as a mixture of two silicates of alumina, sulphite of soda, and sulphide of sodium—the blue coloring principle being a compound of the latter two; while the other portion differs from the former in resisting the action of hydrochloric acid, and contains a variable amount of sand, clay, oxide of iron, and sulphuric acid. Ultramarine, if heated in the air, gradually assumes a dull green tint; and it is quickly decomposed by the action of the mineral acids and chlorine.

The term *yellow ultramarine* is sometimes given commercially to chromate of baryta, a yellow insoluble powder used as a pigment.

ULTRAMONTANE (Lat. beyond the mountains—the Alps—viz., in relation to France), that party in the church of Rome which assigns the greatest weight to the papal prerogative. The pope, according to the Ultramontane doctrine, is superior to general councils, and independent of their decrees; he is considered to be the source of all jurisdiction in the church; and it is through him, and not directly in virtue of their episcopal office, that the bishops derive their powers of "jurisdiction," as distinguished from those of "order." See **ORDERS**. The Ultramontane school has been the opponent of those doctrines and views which favor the right of self-government by national churches. The school opposed to the Ultramontane is called the Gallican. See **GALLICAN CHURCH**.

ULTRA VIRES, a legal term meaning, literally, "beyond one's powers," and employed since the law of corporations has become of great importance, to indicate acts or contracts entered into by corporate bodies, beyond the scope of the powers given them expressly or from implication in their charters. It is clear that the corporation can, itself, take no advantage from, or demand the enforcement of, such a contract; and, hence, the question commonly arising is, how far or in what cases will the corporation be allowed to set up its own lack of authority to enter into a contract as a valid defense against its enforcement by the other contracting party. The general rule is that the contract is void; but where the second party has performed his part of the agreement and the corporation has received benefit, as money or other valuable consideration, decisions differ widely. The extreme ground has been taken that the contract is not only void but illegal, as against public policy, and that no action growing out of it can be maintained. On the other hand, it has been held that the corporation is, on common law principles, *estopped* from setting up *ultra vires* as a defense, unless the contract be illegal in itself or expressly prohibited. But the most reasonable view is that which, while declaring that no action can be maintained on the contract itself, as it is void, allows the second party to recover by the appropriate legal action the money or consideration paid, after the contract has been rescinded. Where a corporation has acted *ultra vires* proceedings may be taken by the state by *quo warranto*, and it is no defense that the officers or agents of the company acted without the express authority of the corporation. The charter may be revoked as a penalty for acts *ultra vires*.

ULUGH-BEG, the grandson of Timūr (q.v.), governed w. Turkistan as regent for his father shah Rokh, while the latter was employed in regulating the affairs of the southern half of the empire, and succeeded, in 1447, to the imperial throne on his father's death. He was a successful warrior, as was of necessity every ruler of this period; but happening, unfortunately, to conceive suspicions of the loyalty of his eldest son, suspicions founded only upon astrological indications, the offended and injured prince rebelled, defeated and captured his father, and soon after caused him to be put to death, thus fulfilling the prediction, 1449 A.D.

Ulugh-Beg is known to posterity as the founder of the observatory at Samarcand, as the liberal patron of astronomers, and as himself a most diligent observer. The astro-

nomical tables which bear his name, in all probability compiled by himself and his two fellow-laborers, Salah-ed-din Cadizadeh al Roumi and Gaiathed-din Mohammed Jerusalem al Coughi, enjoy a high reputation for accuracy, considering the time when they were compiled, and the means of observation in the hands of astronomers. The astronomical works of Ulugh-Beg were written in Arabic, afterward translated into Persian, and thence the chronological portion of them rendered into Latin (Lond., 1630), by Greaves, who followed with a Latin version of the geographical part in 1632. An independent version of the same work in Latin and Persian was published by Dr. Thomas Hyde, at Oxford, in 1663. A new edition of Ulugh-Beg's catalogue of stars will be found in the *Memoirs of the Royal Astronomical Society*, vol. xiii.

ULULATION (Lat. howling). It sometimes happens that articulate sounds or cries resembling, perhaps imitative of those of animals, or mere shrieking and howling, form the sole or chief symptom and characteristic of a morbid mental state. The act is automatic, and may be regarded as indicative of grave changes in the physical and moral nature. In the middle ages, during great religious excitement, and those mental epidemics which involved large communities, such phenomena appear to have been of frequent occurrence. It appears that in the 18th c., a family of five sisters, in the county of Oxford, were affected with a modification of hysteria, during which they howled or barked like a dog; and that about the same period, a large religious community of females in France, one and all, and at the same hours, shrieked or mewed like cats; and were only reduced to sobriety and to silence by the presence of military.—Laycock on *Nervous Diseases of Females*, p. 286; Calmeil, *De la Folie considérée sous le point de Vue Pathologique, Philosophique, Historique, et Judiciaire*, t. ii. p. 310.

ULVA. See **LAVER**.

ULVERSTON, a small but important market-t. and sea-port of Lancashire, in the district of Furness, 22 m. by railway n.w. of Lancaster. It stands in an extensive agricultural and mining district, and is the center of commerce for Furness, and for parts of Cumberland and Westmoreland. It contains cotton and paper mills, and carries on manufactures of linen, ropes, and woolen yarn, and has a coasting-trade in iron and copper ores, limestones, grain, and gunpowder. Pop. '71, 7,607.

ULYSSES, ULYXES, AND ULIXES, the Latin forms of the Greek ODYSSEUS, i.e., the "Angry," the name of one of the most celebrated heroes of the Trojan war. Different accounts are given of his parentage; but according to the oldest legend, the Homeric, he was the son of Laertes, prince of Ithaca (one of the Ionian isles), and of Anticleia, daughter of Autolycus. According to a later account, his father was the crafty Sisyphus; whence he is sometimes called, by way of reproach, Sisyphides. He married Penelope (q.v.), by whom he became the father of Telemachus. While still a youth, he had acquired a reputation for courage, eloquence, and address. When the expedition against Troy was resolved on, Agamemnon visited Ithaca, and prevailed on Ulysses, though with difficulty, to take part in it. Later traditions, or, as in this case, perhaps we ought to call them *inventions*, go on to exaggerate the reluctance of Ulysses to leave his home, and represent him as feigning madness—an artifice which did not, however, succeed. Before hostilities broke out, Ulysses, in conjunction with Menelaus and Palamedes, was sent to Troy, with the view of persuading the Trojans to give up Helen and her treasures; but this little bit of diplomacy having failed, the Greek princes assembled their fleets in the port of Aulis, and sailed for Troy, Ulysses bringing with him twelve ships. During the siege, Ulysses performed important services for the Greeks. In prudence, ingenuity of resource, and *finesse*, he was the foremost of the Hellenic chiefs, while in courage he was inferior to none. After the fall of Troy, the most interesting part of Ulysses's career begins, and forms the subject of the Homeric poem called the *Odyssey*. Several of his adventures are manifestly of eastern origin, and closely resemble those of *Sinbad the Sailor*. Setting sail for home, his ships were driven by a storm on the coast of Thrace; where he plundered the town of Ismarus, but lost a number of his crew. Having re-embarked, a north wind blew them across the Ægean and the Levant, to the country of the Lotophagi (the "Lotus-eaters"), on the coasts of Libya, where the companions of Ulysses ate of the wondrous fruit, and wished to rest forever. (Our readers will remember Tennyson's delicious rendering of this episode.) But their leader compelled them to leave the land "in which it alway seemeth afternoon;" and sailing on again, they touched at the "island of goats," where Ulysses left all his ships but one. Thence he proceeded westward, till he reached the "island of the Cyclopes" (Sicily), where occurred the incident narrated under POLYPHEMUS (q.v.). The island of Æolus, and the city of the Læstrygonæ (a race of cannibals), whither fortune and the winds next carried the Hellenic chief, are supposed to be only names for particular parts of Sicily. Thence he sailed westward to the island of Ææa, inhabited by the sorceress Circe (q.v.). After a year's sojourn, he departed, and sailing still further w., crossed Oceanus, the "ocean-stream," into the country of the Cimmerians (q.v.), where darkness reigns perpetually. Here (following the advice of Circe) he descended into Hades (q.v.), and inquired at the blind seer Teiresias how he might get back to his native land. Teiresias disclosed to Ulysses the fact of the implacable enmity of Poseidon (Neptune), on account of his having rendered Polyphemus (who was a son of Poseidon by the nymph

Thoosa) blind, but encouraged him at the same time with the assurance that he would yet reach Ithaca in safety, if he would not meddle with the herds of Helios (the sun-god) in Thrinacia. Ulysses now retraced his course, and once more visited Circe, the kindly sorceress, who forewarned him of the dangers he would yet have to encounter, and how to act. A w. wind blew them past the perilous island of the Sirens (q.v.) to the coasts of Italy. In passing between Scylla and Charybdis, the monster that inhabited the first of these rocks devoured six of Ulysses' companions. He next came to Thrinacia, which he would fain have passed by, but his crew insisted on landing, and in spite of their oath, killed some of the cattle of Helios while Ulysses was asleep. The anger of Zeus was kindled. When they had sailed away, a fierce storm arose, and Zeus sent forth a flash of lightning that destroyed the ship. Every one on board was drowned except Ulysses himself, who, after many dangers, reached the island of Ogygia, the abode of the nymph Calypso, with whom he lived for eight years. After his departure (which was commanded by Zeus, who had promised to Athens that Ulysses should one day see Ithaca again—the poet always represents him as having a longing after his native isle), Poseidon persecuted him with a storm, and cast him on the shores of Scheria, the island of the Phæacians, in a very forlorn and indescribable condition. He was, however, very kindly received by Nausicaa, daughter of king Alcinous; and having revealed his name at a feast, the monarch provided him with a ship to carry him home. Ulysses was asleep when the vessel approached the coast of Ithaca; and the Phæacian sailors who had accompanied him bore the unconscious hero to the shore, and left him there. When he awoke, he did not at first recognize where he was; but Athens appearing, informed him, and of all that had happened to Penelope (q.v.) in his absence. Disguised as a beggar, he repaired to his own court, where he was recognized by his nurse, and, as Homer touchingly describes, by his old dog, Argus. Aided by Telemachus, and the swine-herd Eumæus, he took vengeance upon the insolent suitors of his wife, all of whom, without exception, he slew. Homer records nothing more of Ulysses's history; but he makes Teiresias prophesy, in the 11th book, that the hero would meet a painless death in a happy old age. Another tradition says that he was slain by Telegonus, his son by Circe. Later poets, e.g., Virgil and Ovid, represent Ulysses as a much less noble and valiant character than he appears in Homer; his wisdom and subtlety are changed into cunning and deceit; and instead of heroic courage, he displays the spirit of a coward.

UM is a Kaffir or Zulu word signifying river, and is used as prefix in the names of most of the rivers on the s.e. coast of Africa, from the Great Kei, where the names of Hottentot origin appear to cease, as far to the n.e. nearly as the Sofala coast, where the names Imhambane, Imhampoor, have the same prefix in a corrupted shape. Among the principal rivers on this coast bearing this prefix may be mentioned the Umgazi, Umbashee, Umtata, Umzimvoobo, and Umzimvula, draining Independent Kaffraria; the Umcomanzi and Untugela, in the colony of Natal; and the Umfolusi, Umilatoozi, and Umapoota, between Natal and Delagoa bay. The Hottentot word Kei has the same meaning, and is still preserved in the Kei and Keiskamma rivers, the Keriega, Keisuga, and other streams on the e. coast of Cape Colony.

UMA is, in the epic and Purānic mythology of India (see *religion*, under INDIA), one of the principal names of the consort of the god Śiva. Other names by which she is also usually designated are *Durgā*, *Devī*, *Kālī*, *Pārvatī*, *Bhavadī*, while there are many more belonging to her which are of less frequent occurrence, as *Kātyāyanī*, *Ambikā*, *Haimavatī*, *Sivā*, etc. As Śiva is not yet a deity of the vedic period of India, such of these names as are met with in Vedic writings have there a different import from that assigned to them by the later mythology. Thus, *Ambikā* is, in the Yajurveda, a sister of *Rudra* (q.v.); *Kālī*, a word which occurs in the Mūn'daka Upanishad (q.v.), is there the name of one of the seven flickering tongues of Agni, the god of fire; *Durgā* in a hymn of the Taittiriya Aran'yaka, is an epithet of the sacrificial flame; and *Umā*, when mentioned in one recension of the same Aran'yaka (see VEDA and UPANISHAD), and in the Kena Upanishad, means the Brahma-science, or the knowledge of what is the nature of Brahman, the supreme soul; and in this sense she is identified in the Taittiriya Aran'yaka with *Ambikā*. But since *Rudra* is in later mythology a name of *Siva*, and the Vedic *Rudra* is a form of Agni, the fire, more especially of the fire of the sun; and since *Umā*, in the Kena Upanishad probably designates the power of *Sūrya*, the sun, it becomes intelligible that *Siva* (q.v.), who, at a later period of Hindu religion, is both the type of destruction and contemplation, had then associated with him deities which originally represented the energy of the fire and the power or wisdom of the sun, and that those deities were afterward held to be merely different forms or names of one and the same deity, viz., his female energy (see ŚĀKTAS), or wife. Though this double character of the consort of Śiva is not always discernible in the myths which are connected with special designations of hers, and though at a late period the popular creed looked upon her far more as the type of destruction than as that of divine wisdom, yet the works devoted to her praise never fail to extol her also as the personification of the highest knowledge. Thus, in the *Devīmāhātmya*, the Rishi Mārkan'deya, in reply to a question of king Suratha, says: "By *Devī*, this whole universe, with what is movable and immovable, has been created, and, when propitious, she who bestows blessings leads men to their eternal bliss; for she, the eter-

nal goddess, is the highest wisdom, the cause of eternal bliss, and also the cause of bondage for this world; she, who lords over the Lord of the universe." And in another passage of the same work, she is invoked thus: "O Devi, thou art the seed of the universe, the highest Mâyâ (q.v.): all this world is bewildered, but, descending on earth, thou art the cause of its final liberation: all the sciences are merely different modes of thyself." Similarly, also, in the *Mahābhārata* (q.v.), Arjuna says to her: "Of sciences thou art the Brahma-science," etc.; and in the *Harivansa*, Vishn'u addresses her as Saraswati, the goddess of eloquence, as Smṛiti, tradition, and, of sciences, as the Brahma-science, etc.

The myths relating to this goddess, who is worshiped in various parts of India—particularly, however in Bengal (see ŚĀKTAS)—are met with in the great epic poems and Purāṇas, in poetical works, such as the *Kumārasambhava* (see KĀLIDĀSA), and in modern popular compositions; but the text-book of her worshipers is the *Devīnāhātmya*, or, "the majesty of Devi"—a celebrated portion of the *Mārkanḍeya Purāṇa*, and considered to be of especial holiness by the worshipers of this goddess. In the *Rāmāyaṇa* (q.v.), she is spoken of as the daughter of mount Himālaya (her names *Pārvatī*, *Haimavatī*, *Adityā*, *Gīrījā*, and similar ones, mean "the mountainous or the mountain-born"), and of the nymph Menā, whose elder daughter, however, was the Ganges. According to the Vishn'u and other Purāṇas, she was in a former life *Sati*, the daughter of Dakṣa, who abandoned her corporeal existence in consequence of having been slighted by her father when he performed a great sacrifice, and did not invite Siva to share in it; but it was only as Umā that she bore children to her husband, viz., *Ganeśa*, the god of wisdom, and *Kārttikeya* (q.v.), the god of war. According to the *Harivansa*, she was, in another life, born as the daughter of Yaśodā, and exchanged for Vishn'u, when in his incarnation as *Kṛishṇa*, he was born as a son of Devaki. See VISHN'U. On that occasion, she was killed by *Kamsa* (q.v.); but as soon as he had dashed her to the ground, she rose to the sky, leaving behind her corporeal frame, and became a divine virgin, to whom the gods addressed their praises. Hence her names, *Kuṇḍā*, *Kumārī*, etc., the virgin. This connection between the legendary history of Umā and Vishn'u is also briefly referred to in the *Devīnāhātmya*, though this work is chiefly concerned in the narrative of the martial feats of the goddess. The latter consisted in the destruction by her of two demons, *Madhu* and *Kaitābha*, who had endangered the existence of the god Brahman; and of the demon *Mahishā*, or *Mahishāsura*, who, having conquered all the gods, had expelled them from heaven, and who met Devi, assisted only by her lion, with a numberless host of demons; moreover, in her defeating the army of *Chanḍa* and *Munḍa*, two demon-servants of *Sumbha* and *Nisumbha*; in her killing the demon *Raktavīja*, who had a sort of charmed life, each drop of his blood, when shed, producing hundreds of demons like himself; and ultimately, in her destroying the demons *Sumbha* and *Nisumbha* themselves. In commemoration of her victory over *Mahishāsura*, a festival called the *Durgapūjā*, or *Durgotsava*, is annually celebrated in Bengal. "The goddess," the rev. Mr. Banerjea relates in his introduction to the *Mārkanḍeya Purāṇa*, "is there represented with ten arms, trampling upon the demon, who is also attacked by her lion, and wounded in the chest by her spear. She has also laid hold of him by the hair, and is about to chop off his head. The most popular commemoration of this event takes place in the autumn, about the time of the equinox; and if the practice may be supposed to be 800 or 1000 years old, it is not inconceivable that it was originally fixed at the equinox, though the precession has since made it a few days later. The calculation of the day depends, however, on a certain lunar day; but it can never be earlier than the seventh of Āśvīn, which is about the time of our present equinox; nor can it be more than a month later than that date. The idea of the possible connection of the *Durgapūjā* with the equinox, is suggested by the fact, that there is a corresponding festival about the time of the vernal equinox too, in which, though it is not so popular as the autumnal *pūjā*, the same group of figures is constructed, and the image of the goddess is in the same attitude, with the same attendance, and the same enemy." (For a somewhat more detailed account of this festival, see Moor's *Hindu Pantheon*, p. 156.) Three weeks after the *Durgapūjā*, another festival in honor of this goddess, called the *Kātipūjā*, takes place, to commemorate her victory over *Chanḍa* and *Munḍa*. "The sable goddess," Mr. Banerjea says, "is represented holding the severed head of *Chanḍa* in her hand, with the heads of his soldiers formed into a garland suspended from her neck, and their hands wreathed into a covering round her loins—the only covering she has in the image constructed for the *pūjā*. The worship of *Kālī* (i.e., the black), to which the narrative (of her victory over *Chanḍa* and *Munḍa*) has given rise, is considered by the Hindus themselves as embodying the principle of *tanuśa*, or darkness. She is represented as delighting in the slaughter of her foes, though capable of kindlier feelings to her friends. She is, however styled the black goddess of terror, frequenting cemeteries, and presiding over terrible sprites, fond of bloody sacrifices; and her worship taking place in the darkest night of the month." (For this worship, see also the article *TĪTĪ*.) With Siva, she resides on mount *Kailāsa*, the northern peak of the Himālaya, or in her own palace on the Vindhya mountain, where she amuses herself with hunting. Her representations are numerous and various. Sometimes she is seen riding on a bull, with a trident in her hand, a serpent as bracelet, and a half moon on her forehead; sometimes, when in

the act of fighting Mahishâsura, she rides on her lion (*Manastôla*), the latter standing between the frontal bones of her elephant. Or, as *Bhadra-Kûti*, she is represented "eight-handed, two of her hands being empty, pointing upward and downward, one of her right hands holding something like a caduceus, its corresponding left hand a cup; the next right and left hands a crooked sword, and a shield with an embossed flower or fruit; the superior right hand, an agricultural implement; and the left, the noose to strangle victims with [see *TRUG*.] Her person is richly dressed and ornamented; between her full breasts, a five-headed serpent uprears itself; she has a necklace of human heads; her ear-drops are elephants; and a row of snake-heads peeps over her coronet. Her forehead is marked either with S'iva's third eye, or her own symbol; and her open mouth shows her teeth and tusks, giving her a fierce and threatening aspect." See Moor's *Hindu Pantheon*, where, besides, other descriptions of images of this goddess are given.—For the myths relating to her, see John Muir's excellent work, the *Original Sanskrit Texts*, vol. iv. (Lond. 1863); the *Harivansa*, translated by A. Langlois (Paris, 1834-35); and the *Mârkan'deya Purân'a*, in the *Bibliotheca Indica*, edited, with an elaborate preface, by the rev. K. M. Banerjea (Calcutta, 1862).

UMAN', a t. of Russia, in the government of Kiev, 120 m. s. of the town of Kiev, on the Umanka. It is inclosed by earthen ramparts. Pop. '67, 14,791.

UMATIL'LA, a co. in n.e. Oregon, having the Columbia river on the n.w., a range of the Blue mountains in the s.e.; 5,300 sq.m.; pop. '80, 9,607—8,786 of American birth, 186 colored. Co. seat, Pendleton.

UMBAGOG LAKE, in Oxford co. Maine, and in the t. of Errol, Coos co. N. H.; 15 m. long, from 1 to 10 m. wide, discharging into the Androscoggin. It is famous for its fine trout.

UMBAL'LA, or **AMBA'LA**, a walled t. of India, in a division of the same name in the Punjab, 120 m. n.n.w. of Delhi. Under the walls of the fort are the British cantonments. Pop. '68, of city, 24,040; of cantonments, 16,622; of division, 1,652,728.

UMBELLIFERÆ, *Apiaceæ* of Lindley, a large and important natural order of exogenous plants, containing more than 1000 species, abounding chiefly in the temperate regions of the northern hemisphere. A peculiar regularity distinguishes the inflorescence of most of this order; a number of stalks, radiating from a common center at the top of the stem, or of a branch, each of which bears a flower at its extremity, thus forming what is called an *umbel*. The umbel is often compound, the primary stalks dividing in a radiated manner, and forming *secondary umbels* or *umbellules*. The flowers are generally small, although the umbel which they compose is often large. They are generally white, rarely yellow, still more rarely red, though frequently tinged with pink at the edges; have a 5-toothed calyx, often obsolete, or nearly so; a corolla of five petals, inserted in the top of the calyx, and alternating with its teeth, five stamens, an inferior germen, and two styles. The fruit is very peculiar, and consists of two one-seeded, unopening carpels, rarely fleshy, touching one another on the inner side, and there attached to a little column (the *carpopophore*), their common axis. Each carpel has five primary and four secondary longitudinal ridges, more or less distinct; and beneath the separating furrows there are often linear receptacles of essential oil, called *vittæ*. The umbellifere are mostly herbaceous plants, rarely shrubby. They generally have divided or compound, rarely simple leaves. They generally abound in a resinous secretion, and a volatile oil, from which many of them derive poisonous and medicinal properties, which are more or less common to all parts of the plant, and often highly developed in the seeds. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are secreted, so that they become useful for food, although the peculiar flavor of the essential oil is still retained. The systematic arrangement of the umbellifere has been found difficult by botanists. Sprengel, De Candolle, Koch, and others, have devoted much attention to this order. Of esculent-rooted umbellifere, the carrot and parsnip are the best known examples. Skirret, earth-nut, and arracacha are also of some value. The roots of *anesorhiza capensis* and *fœniculum capense* are used as esculents at the cape of Good Hope. The roots of *chierophyllum tuberosum*, or **SIAM**, are used in the Himalaya. The herbage of *prangos pabularia* is so bland that it is much used in the temperate parts of the East Indies for feeding cattle, and made into hay for winter fodder. It is said, however, to be injurious to horses, although oxen and sheep are rapidly fattened by it. The blanched stems of celery, enlarged by cultivation, are a favorite salad, and those of Alexanders (*Smyrniûm olusatrum*) were formerly used in the same way. The candied stalks of eryngo were once much esteemed, and those of angelica are still used. The leaves of parsley, chervil, fennel, etc., are used for flavoring. Lovage (*levisticum officinale*) is sometimes cultivated as a salad plant. The seeds of anise, caraway, coriander, etc., are used as carminatives. Hemlock, water hemlock, water parsnip, fool's parsley, and many others, are narcotic poisons—asafetida, galbanum, sagapenum, and opoponax are medicinal products of this order.

UMBER, *Scopus umbretta*, an African bird of the family *ardeiæ*, allied to the storks, but having a compressed bill with sharp ridge, the tip of the upper mandible hooked,

and the nostrils situated in a furrow which extends all the length of the bill. It is about the size of a crow, with umber-colored plumage, and the male has a large crest on the back of the head.

UMBER, a mineral used as a pigment, a variety of the iron ore called hæmatite (q.v.), and consisting chiefly of oxide of iron, with some oxide of manganese, silica, alumina, and water. It is soft and earthy, of a dark brown color, and has a conchoidal fracture. It readily imbibes water, and falls to pieces, like newly-burnt lime. It is found in Cyprus in beds. When roasted, becomes reddish brown in color, and in that state is also used as an artist's color.

UMBILICAL CORD, in botany, the connecting link between the placenta of the ovary and the ovule through which pass the vessels which nourish the ovule till it ripens into the seed. In some plants, the ovules are so closely connected with the placenta, that no umbilical cord can be said to exist; in others it is of considerable length.

UMBILICAL CORD, or **NAVEL STRING**, the bond of communication between the fetus (which it enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the center, and the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the vein conveys arterial blood to the fetus, and the arteries return venous blood to the placenta. These vessels are imbedded in a yellow gelatinous matter, known from its first describer (in 1659) as Wharton's gelatine. Nervous filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of attached cord dying away. See the articles **FETUS** (in which there is a figure of the umbilical cord) and **PLACENTA**.

UMBILICAL HERNIA is the term applied to the protrusion of intestine at the navel or umbilicus. It is, for obvious anatomical reasons, of most frequent occurrence shortly after birth; but it is not uncommon in women who have been frequently pregnant. If the hernia is reducible, and the patient an infant, the ordinary course of treatment is, after returning the parts to their proper position, to place the convex surface of an ivory hemisphere on the navel, and to retain it there either with strips of adhesive plaster, or with a bandage. Special trusses are made for the treatment of this affection in adults. In cases of irreducible hernia, a large hollow pad should be worn. If it becomes strangulated, an operation may become necessary.

UMBILICUS is the anatomical term for the navel.

UMBREIT, **FRIEDRICH WILHELM KARL**, 1795-1860; b. Germany; received a theological education at Göttingen. In 1820 he was called to the chair of theology and philosophy at Heidelberg, where he remained till his death. His most important work is *Commentar über die Propheten des Alten Testaments*, 4 vols. (1841-46). In conjunction with Ullmann he established *Studien und Kritiken* (1828).

UMBRELLA (Lat. *umbra*, a shade). As a shade from the sun, the umbrella is of great antiquity. In the sculptures of Egypt, Nineveh, and Persepolis, umbrellas are frequently figured, closely resembling the chaise umbrella of the present day. In the east, however, its use seems to have been confined to royalty; but in Greece and Rome it was more extensive. The custom was probably continued in Italy from ancient times; but at the beginning of the 17th c. the invention seems to have been little if at all known in England. In that century, however, it came into use as a luxurious sun-shade; and in the reign of queen Anne it had become common in London as a screen from the rain; but only for the weaker sex. The first person of the male sex who had the moral courage to carry an umbrella in the streets of London was Jonas Hanway, the founder of the Magdalene hospital, who was newly returned from Persia, and in delicate health. Still, it was long regarded as a sign of infirmity or effeminacy to use them, and those who did so suffered much unpleasant jeering in consequence. They were at first all brought from abroad, chiefly from India, Spain, and France; now the manufacture of umbrellas has reached an enormous extent in Great Britain—the exports alone amounting to the value of £200,000; while, instead of effeminacy, it is considered now a sign of poverty or improvidence not to be possessed of one.

UMBRELLA BIRD, the *cephalopterus ornatus* of South America, the *coracina cephaloptera* of Vieillot. The coracina form a genus of birds separated from the crows (corvidæ) by Vieillot, and divided by him into four sections. The first comprises those species having velvety feathers at the base of the bill; the second, those whose nostrils are covered with hairy feathers directed forward, and with the upper mandible notched toward the end; the third having a bill naked at its base and notched at the point; and the fourth, that remarkable species on which Geoffroy Saint-Hilaire founded the genus *cephalopterus*. The *cephalopterus ornatus* of South America is of a uniform blue-black color. The head and base of the bill is ornamented with a crest forming a covering somewhat like a parasol, composed of straight elevated feathers with white and stiff shafts terminated by black beards which project forward forming altogether an umbrella.

like plume. The sides of the neck are naked, but long black glossy, metallic feathers forming a loose pelerine hanging below the breast spring from the throat and sides of the neck. The tail is long and slightly rounded. It is of the size of the common crow, and is the only species known.

UMBRELLA-SHELL, a genus of branchiferous gasteropod mollusks of the family *pleurobranchidae*, containing three known living, and two extinct, species. The small shell only covers the more important organs, and the shell is often covered by a mantle. See **INVERTEBRATE ANIMALS**.

UMBRELLA-TREE, a species of magnolia growing along the Alleghany mountains from Pennsylvania to Kentucky. It gets its name from the crowding of leaves on the summits of the flowing branches. See **MAGNOLIA**, *ante*.

UMBRIA, one of the ancient divisions of Italy, w. of Etruria, and n. of the country of the Sabines. It is usually described as extending from the Tiber eastward to the Adriatic; but while this was probably the case in pre-historic times, it was not so during any part of the period of which we have authentic knowledge. Tradition, indeed, leads us to believe that at one time the Umbrian territory extended from sea to sea, embracing much, if not the whole, of the country subsequently occupied by the Etruscans; but when the Umbrians first come before us as a distinct people, we find them restricted to the ridges of the Apennines, the low-land region bordering on the Adriatic from the *Æsis* (mod. *Esino*) to the Rubicon, being held by a race of Gallic invaders, known as the Senones. The most notable towns of Umbria were Narnia, Interamna, Aterculum, Spolietum, Mevania, Fulginium, Assisium, Tifernum, Nuceria, Camerinum, Sentinum, Urbinum, Sena Gallica, Fanum, Fortuna, and Ariminum.

The Umbrians were considered in ancient times to be the oldest people of Italy, and were in consequence, vaguely spoken of as "aborigines;" but neither the knowledge of the ancients, nor the methods of investigation which they pursued, allowed them to arrive at any trustworthy ethnological results. Modern researches into their language (of which we possess one important memorial in the tables of Iguvium; see **EUGUBINE TABLES**) have demonstrated that they spoke a tongue closely allied to the Oscan (see **OSCI**), and were therefore, in all probability, members of the Latino-Italian race. These researches further tend to confirm the tradition of their antiquity, for an analysis of the structure of the Umbrian language proves it to be the oldest of the Italian dialects.

The Umbrians make their first authentic appearance in the wars between the Romans and the Etruscans. They would seem to have been destitute of any political organization or unity, for we find that some of their tribes took part with the Romans, and others—probably the majority—with the Etruscans. At any rate, they were subjugated along with the latter people; and we do not read of them again until the third Samnite war, when in conjunction with the Etruscans and Gauls, they joined the Samnites in their last gallant struggle against the imperious supremacy of Rome (q.v.). The confederacy was utterly vanquished in the great battle of Sentinum (295 B.C.), and the Umbrians were again reduced to submission. The establishment of Roman colonies in the *Gallicus Ager*, or territory of the Senonian Gauls, seems to have completely overawed, and gradually even to have Romanized them. They stood faithfully by Rome in the dark years of the Hannibalic war, and were among the first to furnish Scipio with volunteers for the invasion of Africa. In 90 B.C., they obtained the Roman franchise, and thenceforth disappear from history as a distinct people.

UMPIRE is a third arbitrator appointed by two arbitrators in the event of their differing in opinion; and when the reference or arbitration has devolved upon the umpire, his award or umpirage becomes final and binding on the parties.

UMPQUA RIVER, a river rising in the Cascade mountains, Oregon, flowing in a general n.w. course, passing through the Coast range and emptying into the Pacific at Umpqua head about 22 m. n. of Empire City. The length of the river and its greater fork is about 200 m., and the valley through which it flows is very fertile. It is navigable by small steamers for about 100 m. above its mouth.

UMRO HAH, a t. of British India, in the district of Moradabad, n.w. provinces, 80 m. e.n.e. of Delhi. Pop. '71, 32,314.

UNAKA MOUNTAINS, the western and southern part of the Appalachians, along and near the boundary between North Carolina and Tennessee; length between the two states, about 200 m. in a s.w. course. North of the Watanga river the Unakas have three ridges divided by wide and beautiful valleys. In Virginia these ridges unite and are blended with the Alleghanies. The name signifies *white* in the Cherokee language. Where these mountains reach their greatest height in s.w. North Carolina, snow lies on their tops a large portion of the year. The Roan, about midway between Virginia and the French Broad river, is 6,306 ft. high; a bald mountain whose top is about 6 m. in length with three or four rocky knobs, and many acres level or gently sloping, covered with grass and flowers. Several species of plants are the same as on Mount Washington, N. H. This is in many respects the most grand and beautiful of all the mountains e. of the Mississippi river. From it can be seen points in Virginia, Kentucky, Georgia, and Tennessee. Recently a house has been built on it for the reception of visitors in

summer. The great smoky range between the French Broad and Tennessee rivers has the highest of the Unakas; about twenty of their summits being higher than mount Washington. Among these the highest is Buckley's Peak, 6,660 ft., second only to mount Mitchell which is the highest of the Carolina mountains, and the highest e. of the Mississippi. This portion of the Unakas abounds in grand and rugged scenery, and many of the summits are difficult of access. The rocks are granite, gneiss, shales, sandstones, and rarely limestones of the archæan, Laurentian, lower, and upper Silurian periods. The climate is like that in southern Canada. The valleys of the Unakas have very many places suitable for summer resort; the streams abounding in trout, and the mountains with bear, deer, and smaller animals, while gnats and mosquitoes are rare.

UNALASH'KA, an island in the n. Pacific, belongs to the Fox group of the Alen-tian islands, in lat. 55° 52' n., and 166° 32' west. It is 75 m. long, and in some parts 20 m. broad, has a rugged mountainous surface, and is thinly peopled. Ships are here supplied with all necessities except wood.

UNCARIA. See **GAMBR.**

UNCAS, d. 1682; sachem of the Mohegan Indians in Connecticut. He was a Pequot chief till 1635, when he revolted, and collected a number of Indians, who took the name of Mohegans which had once belonged to the Pequots, against whom he now fought as an ally of the English (1637). He was rewarded with a grant of Pequot lands. Several attempts to murder him were made by the Indians. In 1643 he defeated and put to death Miantonomoh. In 1648 the Mohawks and Pocumtucks began an unsuccessful war against him. In 1657 he was besieged by the Narragansett sachem Pessacus, but was relieved by ensign Leflingwell to whom he granted the present site of Norwich.

UNCIAL LETTERS—so called as being an inch (Lat. *uncia*) long—characters of a large and round form, used in some ancient MSS. The earliest form of an alphabet is its capitals, and the oldest Greek and Latin MSS. are written entirely in capitals. Uncial letters, which began to take the place of capitals in the middle of the 5th c., differ from them in being composed of rounded, and not straight lines, and exhibiting a tendency toward greater expedition in style. Uncial writing arose as writing on papyrus or velum became common, the necessity for more rapid execution leading to the practice of curving the lines. Its being more easily learned than the cursive style, was probably the cause of its becoming the favorite mode of writing books of importance among the monkish scribes; while legal instruments, which required greater dispatch, were executed by professional scribes in a corruptive form of the Roman cursive hand. Uncial writing prevailed from the 6th to the 8th, or even 10th century.

During the 6th and 7th centuries, a transitional style of writing prevailed in Italy, and to some extent elsewhere, in which the letters approximated more nearly to the Roman cursive hand; this passed by a gradual transition into the *minuscule* manner, or small hand, which from the beginning of the 10th c., became usual in MSS.—See Silvestre's *Universal Palæography*, translated and edited by sir F. Madden (Lond. 1850); *Traité de Diplomatique*, par deux Religieux Benedictins de la Congrégation de St. Maur (Par. 1775).

UNCLEANNESS, in the Old Testament, betokens a state of bodily infirmity which, for the time being, excluded the sufferer from the "holy community," and which, by the various ceremonies connected with the gradual recovery from this exceptional state, went far to impress the people with the constantly reiterated connection between them and God, and their own destination of being "a holy people." No less did the strict cleanliness enforced by the constant fear of becoming an "outcast" for however brief a period, and the strict supervision exercised by the priests, to whom the sanitary well-being was to a certain extent intrusted, act in a salutary manner. Birth, death, the different sexual functions and infirmities, were all, in different manner, causes of uncleanness, and treated according to their different degrees. To a certain extent, some incongruous admixtures of plants, animals, even materials in one garment, etc., may also be reckoned among things that "defiled" or gave rise to a certain uncleanness. Fruits of a tree during its first three years were not to be eaten, as "uncircumcised" or unclean. About the special ways in which uncleanness was treated, we have spoken under **PURIFICATION**, where also the similarity that has been found between the Jewish laws on these points and those of the Persians and Indians, is touched upon. The uncleanness of the leper is specially treated under **LEPROSY**.

UNCONFORMABLE STRATA are strata which rest on the more or less inclined edges of older beds. The existence of unconformability in a series of strata is an indication of an interval sufficiently long to permit of the consolidation, disturbance, and upheaval, denudation, and subsequent depression of the inferior beds. No indication of the period that has intervened is to be found in the unconformability itself; but some idea of it may be obtained by an examination of the strata that are known to have been deposited subsequent to the inferior rocks, and previous to the overlying unconformable deposits. Thus, in the n. of Annandale, the Silurian basement rocks, which have often

an almost perpendicular dip, are covered by permian sandstone, and this, again, by the boulder-clay, or alluvial deposits. The first break in the strata represents the time during which the Devonian and carboniferous rocks were deposited, when, in all probability, the Silurian strata formed a dry land surface, and supplied some of the materials for these rocks. The second break is all the indication in that district of the lengthened period during which the whole of the secondary and tertiary strata were being deposited elsewhere. The temporal value of the break is not so easily determined, in the majority of cases. It is only in one place in Britain, in a cutting of the St. Helen's railway near Ormskirk, where any apparent unconformability exists between the Bunter and Keuper strata, and even there it is so slight that it was long overlooked; yet this break represents a gap which on the continent is filled by the important sets of strata, the muschelkalk and St. Cassian beds, containing two great assemblages of fossils perfectly distinct from each other. Very frequently, however, no beds are known which fill up the gap between the two unconformable series. Prof. Ramsay has shown that in the paleozoic epoch between the Laurentian gneiss and the permian beds there are ten breaks. Each of these is accompanied by a sudden and remarkable change of fossils, sometimes in the genera, and always in the species. Prof. Ramsay believes these gaps represent a *much greater* interval of time than that to which all the existing paleozoic formations of Great Britain bear witness. Such blanks in the stony records of the world's history are as frequent in the secondary and tertiary epochs as in the paleozoic.

The not taking into account the existence of unconformable stratification, has frequently caused a useless expenditure of money in searching for minerals. It seemed natural to expect that the permian rocks of upper Anundale covered beds of the true coal-measures, but an examination of the numerous natural sections where the base of the permian sandstone is seen, shows that it rests on the Silurian rocks; and the necessarily abortive attempts that have been made to reach coal through the red sandstone have been simply a useless throwing away of money.

UNCTION (Lat. *unctio*, an anointing, from *ungo*, I anoint), the practice of anointing the body, or certain portions of the body, with oil, especially with the oil of olives. It was resorted to by the ancients from motives of health (see OILS), of athletic development, or of luxury; but the practice is noticeable here chiefly in its relations to religion. Anointing with oil seems to have been supposed to carry with it the same effects in spiritual things which it produces in the natural world. It was a rite in frequent use among the Egyptians, as well as the Greeks and Romans; and the Scriptural narrative of the ante-Mosaic religion contains distinct evidence of its use (Gen. xxviii. 18, xxxi. 13). In the Mosaic ceremonial, its use is still more frequent. Priests and kings were anointed on being set apart for their several offices; as were also sacred vessels. The oil employed in these religious unctions was prepared of the most precious perfumes and balsams, and Ezekiel rebukes the Jews (xxiii. 41) for making a similar unguent for their personal uses. The special significance of the rite of unction may be inferred from the circumstance that the popular name of the expected Messiah was the Christos, i.e., the Anointed. In Christian use, anointing from a very early time possessed the same sacred significance. See EXTREME UNCTION. Besides the anointing of the sick, however, there are many other sacred unctions traceable in ancient Christian practice; namely, in baptism, in confirmation, in the ordination of priests and other clergy, in the consecration of churches and altars, the benediction of sacred vessels and utensils, etc. It has also been employed in the coronation of kings; and in some countries, curious traditions and legends are preserved connected with the unction of the king, or arising out of it. See RHEIMS.

UNDERGRADUATE, a student of a university or college who has not yet taken his first degree.

UNDERHILL, JOHN, d. 1672; b. England; a soldier, who emigrated to Boston with the elder John Winthrop. In 1637 he led the colonial force, which, in conjunction with capt. Mason's force, burned the Pequot forts at Mystic, Conn., crushing the power of that tribe, of which he wrote a history in England, having been forced to leave Boston on account of his religious opinions. He was governor of Exeter and Dover in 1641, and afterward settled in Connecticut. He was a member of the general court at New Haven in 1643, and conspicuous in the Dutch-Indian war, 1643-46.

UNDER-LEASE, an alienation by the tenant of a portion of his lease, with a reservation to himself of the reversion. An assignment, on the contrary, is a transfer of the tenant's entire interest in the lease. The tenant and the sub-lessee stand in the relation of landlord and tenant, but between the original landlord and his tenant's lessee there is no priority of estate or contract. The sub-tenant has the same rights to the possession of the premises as his landlord, the original lessee, and no more; so that the original lessor, entering for breach of condition, may dispossess the sub-lessee.

UNDERWOOD, ADIN BALLOU, b. Mass., 1828; graduated at Brown university, was admitted to the bar, and settled in Boston in 1855. He served in the war of the rebellion, was col. of the 33d Mass. infantry in 1862, was at Fredericksburg, Gettysburg, and other battles, and was severely wounded at Lookout mountain. He was brevetted

maj.gen. in 1865. He was appointed surveyor of the port of Boston in 1865, and still (1884) holds that office.

UNDERWRITER AND UNDERWRITING. See INSURANCE, *ante*.

UNDINES (perhaps from *unda*, a wave), the name given in the fanciful system of the Paracelsists to the elementary spirits of the water. They are of the female sex. Among all the different orders of elementary spirits, they intermarry most readily with human beings, and the Undine who gives birth to a child under such a union, receives with her babe a human soul. But the man who takes an Undine to wife must be careful not to go on the water with her, or at least not to anger her while there, for in that case she will return to her original element. Should this happen, the Undine is not disposed to consider her marriage dissolved; she will rather seek to destroy her husband, should he venture on a second marriage. Baron de la Motte Fouqué has made this Paracelsist fancy the basis of an exquisite tale, entitled *Undine*.

UNDULATORY THEORY OF LIGHT. Optics ranks next to dynamics in the category of nearly *exact* sciences—that is, of sciences whose fundamental principles are so well known, that the result of almost any new experimental combination can be predicted mathematically. Given the forces acting on a body, the laws of motion (q.v.) enable us, by purely mathematical processes, to determine the consequent motion. Though we have not as yet arrived at equal perfection in optics, we are certainly far on the way, and probably have now attained nearly all the progress (independent of improvements in our mathematical methods) which will be made until the next great step in molecular physics shall give us the clue to the nature of the minute motions on which light, heat, electric currents, and magnetism depend. The most extraordinary and almost incredible predictions of theory have been verified by experiment, and at present the differences between theory and experiment may be divided into two classes, corresponding to the above exceptions. The first are those depending on the imperfections of mathematical processes, where, because, for example, as we are yet unable to obtain the exact solution of a certain differential equation, we have to content ourselves with an approximate one. But every improvement in our means of approximation is found to introduce a closer agreement between theory and experiment. This difficulty may safely be left to mathematicians. It is otherwise with the second difficulty. This depends on our ignorance of the ultimate nature of matter, and our consequent inability to apply mathematical reasoning in a perfectly correct and sufficiently comprehensive manner. Here the experimenter's work is still required, and it is in this direction that we must in all probability now look for important extensions of our knowledge.

Optics is divided into two parts, *physical* and *geometrical*. Of these, the latter contents itself with assuming certain obvious experimental truths, such as the fact, that light in a uniform medium moves in straight lines, the ordinary laws of reflection and refraction, etc., and, making these its basis, employs mathematics to develop their further consequences. It is thus that theory has shown how to carry to their utmost perfection such exquisite specimens of art as the best telescopes and microscopes of the present day. But these investigations, and their practical application, are wholly independent of the *nature* of light, and cannot be affected by discoveries in that direction.

It is otherwise when we come to physical optics. This commences with the question: "*What is Light?*" and endeavors to deduce from the nature of light the experimental laws which, as we have seen, are assumed as the basis of geometrical optics.

By two perfectly distinct classes of astronomical observations—aberration (q.v.) and the eclipses of Jupiter's satellites—we know that light takes *time* to pass from one body to another—the velocity, however, being enormous—about 200,000 miles per second. Hence it follows, that either *matter* (q.v.) or *energy* (see FORCE) must be transferred from a body to the eye before we can see it. Here we have at once the rival physical theories of light, which have alternatively had the advantage of one another in explaining observed phenomena. It is only of late years that an *experimentum crucis* has finally decided between them—by showing one of them to be utterly incompatible with a result of observation.

Newton adopted the corpuscular theory, in which light is supposed to consist of material particles—i.e., he adopted the first of the two possible hypotheses; and he gave the first instance of the solution of a problem involving molecular forces, by deducing from this theory the laws of reflection and single refraction. We shall see immediately that this beautiful investigation led to the destruction of the theory from which it was deduced. But, independent of this, there are many grave and obvious objections to the corpuscular theory; for it involves essentially the supposition of material particles impinging on the eye with the astounding velocity of 200,000 m. per second! If such particles weighed but the millionth of a pound, each would have something like ten times the momentum (q.v.), i.e., the battering power, and *six million* times the vis-viva (see WORK), or kinetic energy (i.e., the penetrating power), of a rifle-bullet. Suppose them a million times smaller—yet as millions of millions of them must be supposed to enter the eye at once, coming from every point of the surface of every visible object, it seems impossible to reconcile such a hypothesis with the excessive delicacy of the organs of vision.

It is not pretended by the advocates of the rival hypothesis, the undulatory theory of light, that they understand exactly the nature of the transference of energy on which they suppose light to depend; but they take from the analogy of sound in air, and of waves in water, the idea of the existence in all space of a highly elastic fluid (or quasi-solid), provisionally named the *ether* (q.v.), and they suppose light to consist in the propagation of waves in this fluid. Huygens has the credit of having propounded, and ably developed and illustrated, this theory.

As we have seen above, no third hypothesis as to the nature of light is admissible. Many strong arguments against the truth of the corpuscular theory had been furnished by experiment, especially in the early part of the present century; and as they were always met by further and more extraordinary properties which had to be attributed to the luminous corpuscles, the theory had become complicated in the most fearful manner; and this of itself was an almost complete disproof. Still, it held its ground, for Newton's old objection to the rival theory, viz., that on the undulatory hypothesis there should be no shadows at all (witness the analogy of sounds heard round a corner), was as yet unanswered. This difficulty was overcome by Young (q.v.), to whose sagacity we are indebted for the idea of *interference* (q.v.), which completely explained the apparent discrepancy. But the question between the rival theories was finally settled by Fizeau and Foucault, who, by processes entirely different, but agreeing in their results, determined the velocity of light in air and in water.

Now, Newton had shown that refraction, such as that of light by water, if predicated of moving *particles*, requires that they should move faster in water than in air. Huyghens, again, had shown, that if such refraction be predicated of *waves*, they must move

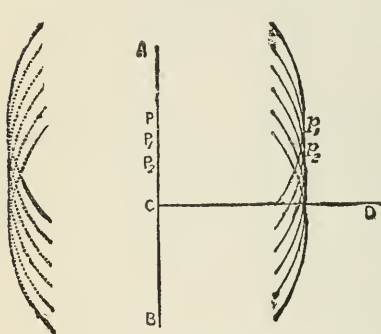


FIG. 1.

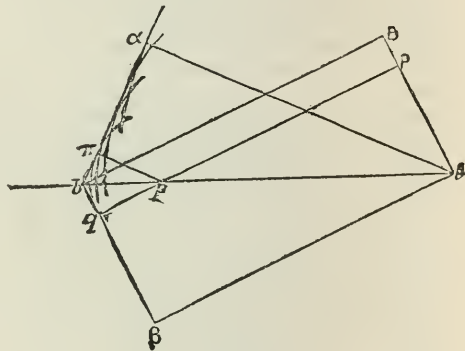


FIG. 2.

slower in water than in air. Fizeau and Foucault found, by direct measurement, that light moves slower in water than in air. Hence it is certain that *light consists in the transference of energy, not of matter*; and the undulatory theory is based upon this fact.

But, as to the manner in which energy is thus transferred, we are entirely ignorant. The common assumption is, that waves of distortion are propagated in the ether. The nature of this motion will be described under *WAVE*. But many other modes have been suggested, one of the most notable of which is that of Rankine. Here the particles of ether are not supposed to be *displaced*, but each is merely made to turn about an axis as the wave of light passes it; the particles having polarity (q.v.), by virtue of which they arrange themselves in similar positions when no light is passing, and by which, also, any rotation of one particle produces a consequent rotation of those in its neighborhood. For the explanation of most of the common phenomena of optics, it is quite indifferent which of these assumptions we make, and, indeed, theory has not yet been carried far enough to enable us to devise experimental methods of testing which is the more likely to be the case in nature. It cannot be too strongly insisted on that all we know at present is, that light certainly depends on the transference of energy from one part of the luminiferous medium to another; what kind of energy is transferred, vibratory or oscillatory motion, or rotation, etc., is a problem which may possibly forever remain unsolved. But vibratory wave-motion being that with which we are most familiar, as in earthquakes, sound, waves in water, etc., we naturally choose this as the most easily intelligible basis of explanation and illustration. And we shall now briefly show how the laws of linear propagation, reflection, single refraction, interference, diffraction, dispersion, polarization, and double refraction may be accounted for.

We assume, then, that light consists in a succession of waves, and for our earlier inquiries it does not matter whether they be (like those of sound) waves of condensation and rarefaction, in which the vibrations take place *in* the direction of the ray, or (like those in water) waves of distortion or displacement without condensation, in which case the luminous vibrations must be assumed to take place in some direction *perpendicular*

to the ray. The phenomena of polarization and double refraction show us that the former of these hypotheses is untenable.

Propagation of Light in a Uniform Isotropic Medium. (An isotropic medium is such that if a cubical portion be taken, it possesses precisely the same properties whatever be the directions of its sides. Glass and water are isotropic, rock-salt and ice are not.)—Suppose AB (fig. 1) to represent at any time the *front* of a plane wave which is passing in the direction CD; i.e., suppose all particles of the ether in the plane AB (perpendicular to the plane of the paper) to be similarly and equally displaced. According to Huygens, we must suppose every particle, P, to be itself the source of a wave, which, from the uniformity of the medium, will spread with the same velocity in all directions. With center P, and radius the space which light passes over in any assigned interval, t , describe a sphere represented in section by a circle in the figure. Do the same for adjacent points P_1, P_2 , etc. Let p_1 be the intersection of the circles whose centers are P and P_1 , p_2 that of the circles whose centers are P_1 and P_2 , and so on. Then, as p_1 is *equidistant* from P and P_1 , and (approximately) from all points of a small circular space between P and P_1 on the wave-front AB, all the separate wave-disturbances coming from these points to p_1 will be in the same *phase* (see WAVE), and will therefore combine so as to strengthen each other; while in other directions they will be in different phases, and combine to destroy each other. The locus of all such points as p_1, p_2 , etc., will therefore, at the end of the time t , contain all particles of the ether quality and similarly disturbed, and will thus be the new wave-front. But it is obviously a plane parallel to AB. Also the disturbance at P has passed to p_1 ; and, when the distance PP₁ is taken as very small, Pp₁ is perpendicular to the wave-front AB. Hence, in such a medium, a plane wave remains plane, and moves with uniform velocity in a direction perpendicular to its front. [There is a difficulty as to what becomes of the disturbance, which, according to Huygen's assumption, ought to travel *back* into the dotted portions of the spheres; and it is not easy to account for the absence of this on mechanical principles. But we are content here to take for granted that no waves are propagated backward from the main wave, as a fact clearly proved by experiment.] Since a small portion of the surface of any curved wave may be considered as plane, we now see now any such wave will be propagated in an isotropic medium. Erecting perpendiculars at every point of the surface of the curved wave, and laying off along these lines the space which light passes over in a given interval, the extremities form a new surface, which is the wave-front after the lapse of that interval.

Reflection at a Plane Surface.—Suppose AB (fig. 2) to be a plane wave-front, moving in the direction Bb perpendicular to AB. Let Ab be the reflecting surface, and let the intersection of the plane of the wave-front with the reflecting surface be a line through A perpendicular to the paper. When B has arrived at b , A would have arrived at β , and P at q (where $b\beta$ is parallel to BA, and Pq and A β to Bb), had it not been for the reflecting surface. Hence, when B is at b , A has diverged into a sphere of radius A β , P from p into a sphere of radius pq; and so for each point of the wave-front. Now, the spheres so described about A and p as centers obviously touch the plane $b\beta$; consequently they touch the other plane $b\alpha$, which makes the angle A $b\alpha$ equal to A $b\beta$. Now, $b\pi\alpha$ is the front of the reflected wave, and A α is the direction in which it is proceeding. Hence, obviously, the ordinary laws of reflection. See CATOPTICS.

Refraction at a Plane Surface into an Isotropic Medium.—Here we take account of the change of velocity which light suffers in passing from one medium to another. In fig. 3, A, P, B, b , p , q , and β represent the same as before—but suppose A α now to represent the space through which the wave travels in the second medium, while it would travel from B to b in the first. With center A, and radius A α , describe a sphere. Let $b\alpha$ touch this sphere in α . Then $b\alpha$ is the front of the refracted wave. For, if $p\pi$ be drawn perpendicular to $b\alpha$, we have

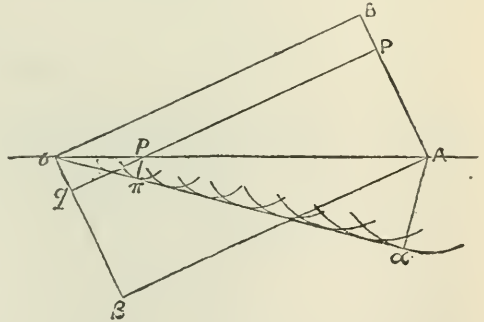


FIG. 3.

$$p\pi : A\alpha :: bp : bA :: pq : A\beta.$$

Hence, while A travels to α , and B to b , P travels to p , and thence to π . And the sines of the angles BA b and A $b\alpha$, which are the angles of incidence and refraction, are to each other as Bb to A α , i.e., as the velocity in the first medium is to that in the second. See DIOPTRICS.

It is obvious from the cut that the *less* is the velocity in the second medium the more

nearly does the refracted ray enter it at right angles to its surface. As a contrast we may introduce here a sketch of Newton's admirable investigation of the same problem on the corpuscular hypothesis. Let AB (fig. 4) be the common surface of the two media, PQR the path of a corpuscle. Let U and V be the velocities in the two media, α and β the angles of incidence and refraction. Then the forces which act on the corpuscle being entirely perpendicular to the refracting surface, the velocity *parallel* to that surface is not altered. This gives

$$U \sin. \alpha = V \sin. \beta.$$

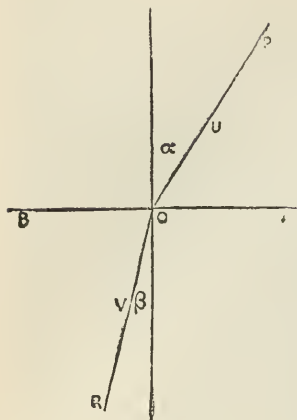


FIG. 4.

Also the kinetic energy is increased by the loss of potential energy in passing from the one medium to the other. Hence the square of V exceeds that of U by a quantity which depends only on the nature of the two media and of the corpuscle. This shows that V is the same whatever be the direction of the ray, and then the first relation proves that the sines of the angles of incidence and refraction are *inversely* as the velocities in the two media, i.e., the refracting ray is more nearly perpendicular to the refracting surface the *greater* is the velocity in the second medium. It is very singular that two theories so widely dissimilar should each give the true *law* of refraction; and in connection with what has just been said, it may be mentioned that on the corpuscular theory a corpuscle passes from one point to another with the least *action*, while on the undulatory theory it passes in the least *time*. Hamilton's (q.v.) grand principle of *varying action* includes both of these.

Interference.—Fresnel's mode of exhibiting this phenomenon (whose discovery as before said is due to Young) is very simple and striking. An isosceles prism of glass, with an angle very nearly 180° , is placed, as in fig. 5, symmetrically in front of a brilliant point, (the image of the sun formed by a lens of very short focus, for instance). The effect of the prism is that light which passes from O through the portion QR

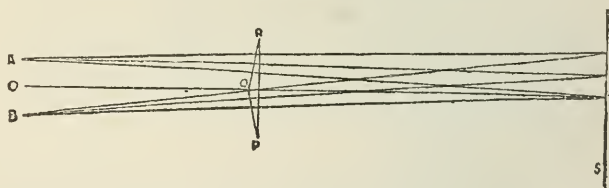


FIG. 5.

appears to have come from some point such as A (the image of O as seen through the upper half of the prism). Similarly the light which has passed through PQ appears to come from some point B . The light which has passed through the prism is to be received on a white screen ST . At the point T , which is in the prolongation of the line OQ , the distances TA and TB are equal; but for no other point, as U in the line ST , are UA and UB equal. Suppose U and V to be such that UA and UB differ in length by half a wave-length of some particular color, VA and VB by a whole wave-length of the same; then waves arriving at T , as if from A and B , have passed over equal spaces, and consequently their crests coincide, so that at T they re-enforce each other. But at U a hollow from A is met by a crest from B , so that darkness is the result. At V , again, crest and crest coincide. And so on. Hence if we are experimenting with one definite color of light, the effect on the screen is to produce at T , V , etc., bright bands of that color, all parallel to the edges of the prism PQR . At points like U there are dark bands. And the length of a wave can easily be calculated from this experiment; for the lengths of OQ and QT can be measured, and knowing the angles of the prism and its refractive index (see REFRACTION) for the particular color employed, we can calculate the positions of A and B . We have then only to measure the distance TV between the centers of the two adjoining bright bars, and then geometry enables us to calculate the difference of the lengths of VA and VB , which as we have seen is the length of a wave. The results of this experiment show how very minute are these wave-lengths for visible rays. Thus for

	Inch.
Extreme Red, the wave-length in air is.....	0.0000266
“ Violet, “ “ “	0.0000167

These are, roughly, the $\frac{1}{30000}$ and the $\frac{1}{60000}$ of an inch. Seeing, then, that light

that is required for the determination of the course of a ray, we must endeavor to find the form in which a disturbance spreads in a double-refracting crystal; and this should lead us to a construction for each of the two rays.

Huygens had already pointed out that one of the two rays produced by Iceland spar follows the ordinary law of refraction. Hence the disturbances which give rise to this ray are propagated in spherical waves in the crystal. He showed also that the other ray could be accounted for, if the disturbances to which it is due were propagated in the form of an oblate spheroid touching the sphere with the extremities of its axis, that axis being parallel to the crystallographic axis of the mineral. The following diagram (fig. 6) will make this clear: P is the point where the ether is disturbed. Two waves spread from P in the form shown in the cut, the line ABP being the axis of rotation of the spheroid, and parallel to the axis of the crystal. Thus, let rays αA , etc. (fig. 7), of which AB is the wave-front, fall upon the surface Λb of such a crystal; and let AC be the direction of its axis. Draw, about A as a center, the sphere and spheroid into which the disturbance at A spreads in the crystal while light in air passes from B to b . Then if planes be drawn through the line b (perpendicular to the paper) so as to touch the sphere in β_1 , and the spheroid in β_2 , these planes will touch respectively all the intermediate spheres and spheroids produced by disturbances at points between A and b . [This is evident from simple geometry.] Thus, $b\beta_1$ and $b\beta_2$ are the new wave-fronts; and the ray αA , falling on the crystal, is divided into the two $\Lambda\beta_1$ and $\Lambda\beta_2$. Of these, $\Lambda\beta_1$ is the ordinary ray, and being produced by spherical waves, has all the properties of a ray ordinarily refracted. It obviously moves perpendicularly to its front, as $\Lambda\beta_1$ is perpendicular to $\beta_1 b$.

But it is otherwise with $\Lambda\beta_2$, which is, in general, *not perpendicular to its front*, $\beta_2 b$. Again, if AC, the axis of the crystal, be not in the plane of incidence, the ray $\Lambda\beta_2$ is not in that plane; so that here we have *refraction out of the plane of incidence*.

The exact accordance of this construction with observation was proved by the careful experiments of Wollaston. We have only to add, that the two rays $\Lambda\beta_1$ and $\Lambda\beta_2$ are, in all cases, completely polarized in planes at right angles to each other.

The experiments of Brewster showed that in by far the greater number of minerals and artificial crystals, *both rays are extraordinary*—i. e., neither of them can be accounted for by disturbances propagated spherically in the crystal. But no tentative process could lead to the form of the wave-surface in this most general case. Here Fresnel's genius supplied the necessary construction.

He assumes that the ether in a crystallized body is possessed of different rigidity, or different inertia, in different directions; a supposition in itself extremely probable, from the mechanical and other properties of crystals. In the general case there are shown to be three principal elastic directions in a crystal, in any one of which, if the ether be displaced, the resulting elastic force is in the direction of the displacement. Each of these is, in all cases, perpendicular to the others. Any given displacement of the ether corresponds to partial calculable displacements parallel to each of these lines, and thus the elastic force consequent on any displacement whatever is known if we know those for the three rectangular directions. All the calculations are thus dependent on *three* numbers only, for each substance.

To find the form in which a disturbance will spread, Fresnel proceeds as follows: Let the plane of the paper represent the front of a wave in the crystal, and suppose a particle of ether to be displaced in it from A to B (fig. 8). This displacement may be resolved (by the law of the parallelogram of velocities, forces, etc.) into two components in any two directions in the plane of the paper. Assume AP to be one of these, and let PQ be the force produced by disturbing the particle of ether from A to P. In general PQ will *not* lie in the plane of the paper. Let fall a perpendicular, QR, upon the plane of the paper. In general the point R will not lie in AP. The portion RQ, of the elastic force of the ether, Fresnel neglects, because it would produce vibrations perpendicular to the wave-front, i. e., *similar to those of sound*, and he assumes that such normal vibrations do not produce visible light. We shall recur to this point. Fresnel now assumes that the vibrations which will be propagated continuously in the crystal are such as have PR coincident in direction with AP; and then the rate of their propagation will depend upon the ratio of PR to PA. He shows by mathematical reasoning that there are *two* such directions in every wave-front, and that they are always *perpendicular* to each other. This, of course, at once accounts for double refraction, the complete polarization of each of the two rays, and their being polarized in planes perpendicular to each other. The original plane wave is now broken into two, both parallel to the first, but in general moving at different rates. He next considers a disturbance at any point in a crystal as equivalent to waves having fronts in *every* plane passing through that point, and investigates mathematically the form of the surface which is touched by the planes of all the pairs of polarized rays which have (in any given time) proceeded from each of those wave-fronts. The form of this surface is very remarkable. It is symmetrical with reference to three planes at right angles to each other. These, of course together, cut it into eight parts, one of which is figured below (fig. 9). From this it appears, though Fresnel did not perceive it, that the surface has four *conical cusps*, as they are called, the inner portion seeming to be drawn through a hole, as it were, and then spreading out again to form the outer portion. The external appearance of these points very much

resembles the portion of an apple round the point of attachment of the stalk. Fresnel showed that, in particular cases, when two of the three principal elasticities are equal, this surface degenerates into the sphere and spheroid of Huyghens already described for Iceland spar; and that, when all three are equal, it becomes a single sphere, as in glass, water, and other singly refracting bodies. All this, of course, is in complete accord with experiment. But there is vastly more. If we use the wave-surface of Fresnel to construct the refracted rays, just as we employed the sphere for simple refraction, or the sphere and spheroid for Iceland spar, we find generally *two* definite refracted rays (both usually out of the plane of incidence) for one incident ray. But Hamilton (q.v.), who was the first to perceive the existence of the cusps already described, saw that they indicated the existence of a very remarkable phenomenon, to which he gave the name of conical refraction (q.v.). The ray which, in the crystal, passes from A to C (the cusp, see last figure), has not, like other rays such as ApP , to definite wave-fronts. For if at p and P , where the line ApP meets the inner and outer portions of the wave surface, we draw tangent planes, these are the definite fronts of the corresponding waves; so that such a ray will split into two only, on leaving the crystal. But AC intersects the surface at C, where it is *conical*, and has an *infinite* number of tangent planes, so that when it leaves the crystal it will split into an infinite number, forming a hollow cone. Hamilton's prediction then was: If a single ray of light be made to pass through a plate of a biaxial crystal in the direction AC (limiting it, for instance, by sheets of tin-foil with small holes in them properly fixed on each side), it will enter and emerge as a hollow cone. Also the plane of polarization will differ for different rays in this cone. Lloyd completely verified this wonderful prediction by experiments made with a plate of *aragonite* (q.v.). But more, Hamilton observed that (see last figure) the wave surface can be

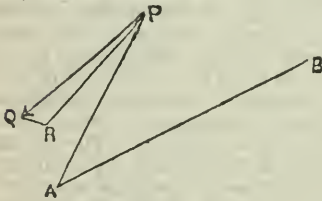


FIG. 8.

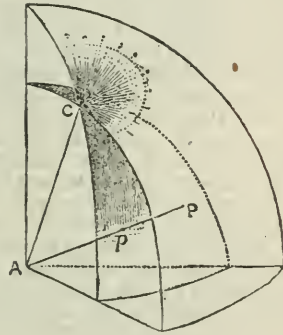


FIG. 9.

touched by a tangent plane in a circle surrounding the cusp. If, then, we make the construction of fig. 7 with Fresnel's wave instead of the sphere and spheroid, there will be a definite direction of the incident ray αA , for which the tangent planes $b\beta$, and $b\beta_2$ in that figure will coincide, and will touch the wave-surface in the circle about the cusp. Any line drawn from A to a point in that circle will be a direction for a refracted ray. Hence the ray αA will be broken up into a hollow cone of rays, the vertex of the cone being A, and its base this circle. If the crystal be cut into a plate each ray will of course emerge parallel to αA , and the *ensemble* of them will form a hollow cylinder. The prediction, then, is that a single definite ray, falling in a given direction on such a plate of crystal, will emerge as a hollow cylinder. This and the predicted laws of the polarization of the light of the cylinder were also verified by Lloyd.

"The formulæ which led to such triumphantly successful predictions *may* have been deduced from incomplete or even erroneous premises; but they *represent a truth*, and must in time conduct us step by step back to ultimate proof of the truth of Fresnel's assumptions, and of the undulatory theory of light, as now understood, or show us what modifications may be required in the original conceptions."

It would unduly lengthen this article, and besides would lead us into discussions far too recondite for a work like this, to enter upon the question of whether the vibrations in polarized light are *perpendicular to or in the plane of polarization*, a subject which has recently been well investigated by Stokes (q.v.); or to consider the production of elliptically polarized light by reflection at the surface of metals, diamond, etc.; and various other most important points of the theory. We can only mention that Green, Cauchy, Stokes, and others, who have entered deeply into the mechanical question of luminiferous vibrations, have found themselves obliged to take into account the *normal wave*, which, as we have seen, Fresnel neglected.

Fluorescence (see PHOSPHORESCENCE), spectrum analysis (see SPECTRUM), and various other important recent additions to the theory, must be merely mentioned: as also the very remarkable observation of Maxwell, which appears to connect light and electricity, and was derived from a theory which assumes the ether to be the vehicle of electricity

and magnetism as well as of light and heat, and by which it appears that the velocity of light is expressible in terms of the static and kinetic units of electricity.

For further information, we refer the reader to Lloyd's *Wave-theory*, an excellent elementary treatise; while to the more advanced mathematician we may commend Airy's *Treatise on the Undulatory Theory*, and Herschel's article "Light" in the *Encyclopædia Metropolitana*.

UNDY, in heraldry, the same as wavy. See **HERALDRY**.

UNFERMENTED BREAD. Under this heading we may briefly notice one or two improvements which have been introduced into the manufacture of **AERATED BREAD**, give some details supplementary to the article under the latter heading in vol. i. of the *Encyclopædia*, and indicate the general bearings of this kind of baking, and of the bread thus produced, upon public health and upon the subject of medical dietetics. In 1863 the "Aerated Bread company (limited)" was established for purchasing from the patentee, Dr. Daughlish, the sole right of manufacturing this kind of bread in and around London; and from that time, the use of this new article of food has become much more extensive. Indeed, at the present day, Daughlish's aerated bread is manufactured (by purchase of the right to use the process) not only in most of the large towns in England, but also in Melbourne, Adelaide, and Sydney. In the working of the original patent, it was found that the pressure at the commencement of the process of driving the mixed ingredients from the iron box through a cock or tap at the bottom was so violent as to give almost an explosive expansion to the ejected portion of dough, causing the structure of the bread more to resemble whipped cream of froth than fermented bread. This was a point of greater importance than might have been anticipated, because it is found by experience that the flavor and other palatable qualities depend in a great measure on the internal arrangement of the loaf. Moreover a great part of the pressure obtained was entirely wasted. A new patent was, after a time, taken out by Dr. Daughlish, to improve the "piled elastic texture" of aerated bread; and secondly, to provide mechanical means for dividing the dough into the requisite exact and uniform measured quantities for loaves, and for delivering each loaf into the tin in which it is to be baked. Dr. Daughlish's last patent—his new mechanical or traveling oven—was only completed shortly before his death, which took place in the spring of 1866. In this oven, the loaves, after being placed on the movable bottom at the mouth, are carried with a regular intermittent motion, in an endless chain, which forms the movable bottom, through a chamber varying in length from 20 to 50 ft., to the end or tail of the oven. This chamber is heated by two or more furnaces, the flues of which are kept separate, each furnace heating its own portion. Small windows are inserted at intervals, by means of which the baking can be watched during its progress. The mouth of the oven is protected by two doors, which are lifted and shut alternately by an arrangement of apparatus worked by the same power which causes the endless chain constituting the movable bottom to traverse the length of the oven; the work of charging the oven goes on incessantly while the loaves are on their journey toward the tail of the oven; and the opening and shutting of the two oven doors is so arranged as to prevent the escape of the heat or steam from the interior of the oven. On the arrival of the loaves at the tail of the oven, the baking process is completed, and they are tipped off the revolving bottom, falling, by their own weight, on to a table placed ready to receive them. The mechanism at the tail of the oven is likewise so arranged as to prevent the escape of the heat or steam in the oven. By means of this traveling oven, the old and laborious plan of putting into and taking out of the oven each loaf separately with the peel (so injurious to the health of the journeyman baker) is henceforth abolished in the making of aerated bread. The great point mentioned above, namely, lessening the amount of pressure brought to bear on the gas, has had its value fully borne out by recent experience. At present (1879) 90 lbs. pressure per square inch has been lessened to 30 lbs., to the saving of steam-power, and improving the quality of the bread. The Americans have tried an enormous pressure, but, we believe, without satisfactory results.

At first the carbonic acid gas employed in the manufacture of aerated bread was solely obtained from carbonate of lime and sulphuric acid. The aerated bread company, however, made experiments regarding the possibility of applying the carbonic acid of the great London breweries (now a wasted product) to the aeration of their bread, and the results hitherto obtained have been most satisfactory; while there is not the slightest doubt of the essential purity of the gas, in so far as deleterious matters are concerned, the delicate flavor of both hops and malt conveyed in the form of aromatic vapor by the gas to the dough communicates to the bread a singularly agreeable and palatable taste. Two gallons of new malt and hops partially fermented at a temperature of 160° F. are added to 268 lbs. of flour.

No one who takes an interest in the sanitary conditions of various trades, and who has read Mr. Tremeneer's "Report on the sanitary condition of Journeymen bakers," published by order of government; or a powerful article upon that commissioner's report in the *Times*; or the pamphlet by Dr. Guy on the same subject, can doubt that the general introduction of aerated bread would cause the saving of a large number of human lives, now annually sacrificed in the London bakeries alone. Dr. Guy states that no class of men, save the Redditch needle-grinders, are liable to so severe

and often fatal diseases of the chest. Forty-two years is rather over the average duration of life among them, and they are often completely enfeebled in very early life by frequent attacks of rheumatism. Under the new system, the business of a journeyman baker, from being almost certainly fatal, would become a healthy rather than a dangerous one.

The dietetic advantages of aerated bread are apparently so obvious, that it is surprising that they are not even more generally recognized than seems at present to be the case. Its perfect cleanness and purity, its light and uniform texture, and its sweet and agreeable flavor, are strong claims upon acceptance. To the working-man, it is especially suited, because it retains much of the ingredients of the wheat which enter into the formation of blood and muscle, and are allowed to escape in fermented bread. It is strongly recommended by medical men not only as an article of ordinary diet, but particularly in cases of indigestion; and according to Dr. Corfe of the Middlesex hospital, most especially "in those cases of dyspepsia which so often affect the brain-workers of the great metropolis, men who work for the press, etc." Cases of indigestion, flatulence, etc., not unfrequently occur in which no kind of bread (even well-made country bread) can be borne with comfort. In such instances, if there is no ready access to aerated bread, it may be obtained weekly in a tin box from London, as, among other advantages, it possesses that of being almost as palatable on the tenth day as on the day of its baking. The aerated bread has been found singularly valuable as food for infants, when they are being brought up wholly or partially by hand. When mixed with milk and water, the bread forms a soft jelly-like compound which is easily sucked through the tube of a common feeding-bottle.

In the commercial organization of the company, as developed in London, there is, in the first place, a large bakery attached to the central offices in Whitecross street. The metropolis is divided into districts, somewhat resembling the postal districts. Four of these have bakeries as well as depots; the others have depots without bakeries, the bread being obtained from adjacent districts. Altogether, there are about fifty depots or shops at which the bread may be purchased. The company prefer that these depots should be placed in the keeping of agents who are the servants of the company, paid either by salary or commission, or both.

UNG, a co. in n.e. Hungary, in the Cis-Tubiscan circle; 1180 sq.m.; pop. about 130,032. It contains the mineral springs of Szobráncz. Capital, Ungvar.

UNGHVAR, an important market t. in the n.e. of Hungary, is charmingly situated on the river Ungh, 90 miles n.e. of Debreczin. It is the residence of a bishop, and contains a very old castle, a beautiful church, a seminary, and gymnasium. Trade is carried on in salt, cattle, and wine, particularly the last, vines being extensively cultivated in the vicinity. The population of Ungvar in 1869 amounted to 11,017.—Ungvar is also the name of a county or district containing about 1200 sq. miles, and a population of 130,000.

UNGUENTS, or OINTMENTS, are employed in medicine as external applications. They consist of some active agent in solution or in the form of a soft extract, or in fine powder, carefully rubbed up with some kind of fatty matter, or a mixture of several such matters, as prepared lard, prepared suet, white wax, yellow wax, olive oil, and almond oil. There are no less than 28 ointments in the British *Pharmacopœia*. Some, as the ointments of aconitia, atrocia, and belladonna, are employed to allay neuralgia and local pains; simple ointments (consisting of white wax, prepared lard, and almond oil) are employed in dressing raw and blistered surfaces; the ointments of cantharides and of savin are used to keep up the discharge from issues or blistered surfaces; the ointments of creosote, galls, carbonate of lead, oxide of zinc, etc., serve as astringents; those of ammoniated mercury, calomel, nitrate and red iodide of mercury, iodine, iodide of potassium, elemi, resin, and turpentine, act as astringents of varying power, and that of red oxide of mercury as a mild caustic. Many of the ointments are of special service in skin diseases, and sulphur ointment is the specific application for itch.

UNGUICULA'TA (Lat. clawed), in zoology, a section of the class mammalia, consisting of those animals which have toes furnished with nails or claws. In the system of Linnaeus, it includes the orders *bruta*, *glîres*, *primates*, and *feræ*; in that of Cuvier, the orders *bimava*, *quadrumanâ*, *carnaria*, *marsupialia*, *rodentia*, and *edentata*.

UNGULA'TA (Lat. hoofed), in zoology, a section of the class mammalia, consisting of those animals which have hoofs. In the system of Linnaeus, it includes the orders *belluæ* and *pecora*; in that of Cuvier, the orders *pachydermata* and *ruminantia*.

UNGULA'TA (*ante*). The order of hoofed quadrupeds is one of the largest of the mammalian division of vertebrate animals. It comprises three entire old orders, the *pachydermata*, *solidungula*, and *ruminantia*. The *pachydermata* included the elephant, rhinoceros, hippopotamus, tapir, and the pig, animals having thick skins, and the name *pachyderm* is still applied to them as members of the order *ungulata*. The elephant, however, is removed to a separate order, *proboscidea*. The old order *solidungula* included the horse, zebra, and ass, all having solid, or one-toed hoofs, and the name *solidungula* still applies to them as a section of *ungulata*. The old order *ruminantia* included the ox, sheep, goat, camel, deer, giraffe, and other animals which chew

the cud or *ruminate*, and have a split hoof, with two functional toes; and the ruminantia form a group or section of ungulata. As combined in one order the ungulata are characterized as follows: All the four limbs are present, and that portion of the toe which touches the ground is always incased in a greatly expanded nail or *hoof*. In consequence of the incasement of the toes in hoofs, the limbs have no prehensile function, and are entirely subservient to locomotion; consequently, clavicles are wanting in the entire order. There are two sets of enameled teeth; the molars are massive, and have broad crowns, adapted for grinding vegetable substances.

The order is divided into two primary sections according to the number of toes; the *perissodactyla*, in which the toes or hoofs are odd in number, and the *artiodactyla*, in which they are even. The section *perissodactyla* includes the rhinoceros, tapir, horse, and its allies, and some extinct forms, all having the following characteristics; hind feet odd-toed, and also the fore-feet, except in the tapirs and brontotheriidae. The dorso-lumbar vertebræ are never less than 22 in number, and the femur has a third trochanter; horns, when present, not paired (except in brontotheriidae and diceratherium). There is usually only one horn, but when there are two, one is placed behind the other in the middle line, and in no case are they supported by horn cores. Stomach simple, and there is a large cæcum. The three groups of perissodactyle ungulates, the horses, the tapirs, and the rhinoceroses, are widely separated in many important characteristics, but the intervals are filled by an extensive series of fossil forms, which commence in the lower tertiary strata. The perissodactyle section includes the following seven families: *Fam. 1. Coryphodontidae* (Marsh) comprising a number of tapir-like animals found in the eocene; skull without horns, and with small nasal bones; brain remarkably small; dental formula; $i \frac{3-3}{3-3}; c \frac{1-1}{1-1}; pm \frac{4-4}{4-4}; m \frac{3-3}{3-3} = 44$. The canines are not

large, molars of tapiroid type, having two transverse ridges. Limbs short, both fore and hind feet furnished with five complete toes, all having hoofs. *Fam. 2. Rhinocerotidae*, including only one genus, *rhinoceros* (q.v.). *Fam. 3. Tapiroideæ*, see TAPIR, *ante*. *Fam. 4. Brontotheriidae*, large fossil mammals, found by prof. Marsh in the miocene of North America, having in the fore feet four nearly equal toes, and in the hind feet three, thus resembling the tapirs. See TITANOTHERIUM. *Fam. 5. Palæotheriidae*, including extinct ungulates from eocene and miocene, and characterized by having three toes to all the feet, canine teeth, and with the lower molars having a double-crescentic form. See PALEOTHERIUM, *ante*. *Fam. 6. Macrauchenidae*, comprising the single genus *macrauchenia*, from the late tertiary deposits of South America. These animals were of large size, having three-toed feet, and a third femoral trochanter, and with cervical vertebræ like those of the camels. General form of skull, equine, and the incisors have

a coronal pit; diastema small; dental formula: $i \frac{3-3}{3-3}; c \frac{1-1}{1-1}; pm \frac{5-5}{4-4}; m \frac{3-3}{3-3} = 46$.

Fam. 7. Solidungula or equidae. This family comprises the horse (q.v.), the ass (q.v.), and the zebra (q.v.). See also HORSE, FOSSIL. The family *equidae* is divided by Dr. Gray into two genera, *equus*, comprising the horse, and *asinus*, comprising the asses and zebras. Many authorities, however, place all the forms under the single genus *equus*.

The section *artiodactyla* comprises those ungulates in which the number of toes is even, either two or four. The dorso-lumbar vertebræ are nineteen in number, and the femur has no third trochanter. If horns are present, they are always in pairs, and are supported by bony horn-cores. The antlers of the deer are also paired, but they are not regarded as true horns. The stomach is always more or less complex, or is divided into separate compartments, and the cæcum, unlike that in the previous section, is small and simple. This section comprises the hippotamus (q.v.), the pigs, see HOG; the whole group of ruminants, see RUMINANTIA, including the ox (q.v.), sheep (q.v.), goat (q.v.), antelope (q.v.), camel (q.v.), llama (q.v.), giraffe (q.v.), deer (q.v.), and others. Besides these there is an extensive series of fossil forms, commencing in the eocene formation, and passing into miocene, pliocene, and recent. The sub-section *omnivora* comprises the following families: 1. *Hippopotamidae*, containing the single genus *hippotamus*, hav-

ing dental formula, $i \frac{2-2}{2-2}; c \frac{1-1}{1-1}; pm \frac{4-4}{4-4}; m \frac{3-3}{3-3} = 40$. *Fam. 2. Suidæ* (q.v.), comprising the pigs and peccaries (q.v.). The permanent dental formula in the boar (*sus scrofa*) is: $i \frac{3-3}{3-3}; c \frac{1-1}{1-1}; pm \frac{3-3}{3-3}; m \frac{3-3}{3-3} = 40$. But a young pig up to its third year

has four premolars and three molars on each side. *Fam. 3. Anoplotheriidae*, of eocene and miocene, is regarded by many modern paleontologists as a transition stage between the swine and the ruminants. In *anoplotherium*, the body is slender, provided with a long tail, and the feet terminated by two toes each, sometimes with the addition of small accessory hoofs. The dentition is remarkable in having no diastema between the canine and molar teeth, thus forming an uninterrupted series. The dental formula is:

$i \frac{3-3}{3-3}; c \frac{1-1}{1-1}; pm \frac{4-4}{4-4}; m \frac{3-3}{3-3} = 44$. *Fam. 4. Oreodontidae* (q.v.). The last section of artiodactyle ungulates is the great group ruminantia, to which reference has been made in this and other articles.

UNGULED, in heraldry, a term applied to the tincture of the hoofs of an animal; e.g., azure, a stag trippant or; attired and unguled gules, the arms of the family of Strachan in Scotland.

UNICOL, a co. in e. Tennessee, separated from North Carolina by a range of the Iron mountains; about 300 sq. m.; pop. '80, 3,645—3,642 of American birth, 119 colored. Co. seat, Vanderbilt.

UNICORN (Lat. *unum cornu*, one horn), an animal probably fabulous, mentioned by ancient Grecian and Roman authors as a native of India, and described as being of the size of a horse, or larger, the body resembling that of a horse, and with one horn of a cubit and a half or two cubits long on the forehead, the horn straight, its base white, the middle black, the tip red. The body of the animal was also said to be white, its head red, its eyes blue. It was said to be so swift that no horse could overtake it. The oldest author who describes it is Ctesias, who resided for many years as physician at the court of Artaxerxes Mnemon, and who wrote about 400 B.C. His information, however, was all at second-hand. He calls it the wild ass (*onos agrios*). Aristotle briefly mentions it under the name of Indian ass, saying: "We have never seen a solid-hoofed animal with two horns, and there are only a few of them that have one horn, as the Indian ass and the oryx." Pliny nearly follows Aristotle, but says that the Indian ass is one-hoofed, and the oryx two-hoofed. He speaks also of the *monokeros*, a very fierce animal, with the body of a horse, the head of a stag, the feet of an elephant, the tail of a wild boar, and a single horn. All these accounts are evidently untrustworthy, and much tinged with fable. Not more credible are those of more modern authors. Lobo, in his *History of Abyssinia*, describes the unicorn as resembling a beautiful horse; but there is no good evidence of the existence of any such animal there or in any part of the world. Its existence, however, is not to be decided against on any other grounds; for there does not appear to be anything monstrous or absurd in the notion. Although the descriptions of the unicorn given by the ancients are very unlike the Indian rhinoceros, yet probably that animal was the origin of them all. In like manner, it seems probable that the head of a unicorn, which Barrow saw depicted on the side of a cavern in south Africa, and the head of a unicorn described and figured by Campbell in his *Second Journey in South Africa*, are to be referred to some species of rhinoceros. The word unicorn is unhappily used in versions of the Old Testament for the Hebrew *rēm*. The Septuagint led the way in this, by using the Greek *monokeros*; and it has been supposed by many that the animal meant is a rhinoceros. The *rēm* was, however, certainly not a one-horned, but a two-horned animal. In Deut. xxxiii. 17, where the English version has "horns of unicorns," the correct translation is "horns of a *rēm*." Other circumstances, as an allusion to the gamboling of the young, are also unfavorable to the idea that a rhinoceros is intended.

The unicorn is perhaps best known as a heraldic charge or supporter. Two unicorns were borne as supporters of the Scottish royal arms for about a century before the union of the crowns; and the sinister supporter of the insignia of the United Kingdom is a unicorn argent, armed, crined, and unguled, or gorged with a coronet composed of crosses patée and fleurs-de-lis, with a chain affixed, passing between the fore-legs, and reflexed over the back, of the last.

UNIFORM (one form), in its military and naval sense, means the particular dress and equipment assigned by proper authority to each grade of officers and men. The clothing consists of one prevailing color, variously ornamented and "faced" according to the rank and corps. Although some regiments wear other colors, scarlet may be said to be the prevailing uniform of the British army; blue of the French; and white of the Austrian: dark blue is likewise the color of the British navy. It is surprising how late the introduction of compulsory uniforms took place. We find soldiers serving with corps and yet dressed after the dictates of their own fancy well into the 17th c.; while in the navy uniforms were not fixed with certainty until the beginning of the reign of king George III.

UNIFORMITY. ACT OF. See NONCONFORMISTS.

UNIGENITUS. BULL. one of the most important documents in the history of Jansenism. It was occasioned by the publication of the *Réflexions Morales* of Quesnel (q.v.), in which all the essential principles of Jansenism were revived, and although cautiously, yet systematically explained, so as to form the basis of that practical, moral, and religious teaching which it is the object of the *Réflexions Morales* to convey. The book was at first simply prohibited by a brief of pope Innocent XI., in the year 1708; but, as it found many patrons, and especially the archbishop of Paris, cardinal de Noailles, it was deemed necessary to subject it to a more detailed examination, the result of which was that 101 propositions were extracted from it, and formally condemned, in 1713, by a bull commencing with the word "Unigenitus." The mode of condemning these propositions was peculiar, being that which is technically called *damnatio in globo*. The whole body of propositions were condemned as "heretical," "false," "rash," "scandalous," "offensive to pious ears," etc.; without, at the same time, any particular propositions being pointed out as deserving any one of these specific forms of censure. This circumstance, with others, gave rise to much controversy, and to a prolonged opposition to the bull. De Noailles and other bishops refused to accept it unless with certain qualifications; on the

contrary, Louis XIV. insisted on unconditional acceptance; but on the death of Louis, the regent, the duke of Orleans, having given his countenance to the opponents of the bull, the resistance was persisted in; and eventually a declaration was put forth in 1717, by certain bishops, four in number, appealing from the pope to a general council. This appeal was condemned by the pope, nor was it countenanced even by the regent; but a more modified appeal "from the pope ill-informed to the pope better informed," was afterward published by De Noailles, which obtained many adherents, and by which the opposition was kept alive to the end of the pontificate of Clement XI. in 1721, and even under his successors, Innocent XIII. and Benedict XIII. It was not till the year 1730 that, after the formal registration of the bull *Unigenitus* by the parliament of Paris, the party thus created in France, and known under the name of "appellants," received its final condemnation from the civil authority, after which it gradually died out, although some relics of it are still traceable, even after all the storms of the revolution, in the so-called "*Petite Eglise*." See **GALLICAN CHURCH**.

UNION. The crowns of England and Scotland were united under one sovereign on the accession of James VI. of Scotland to the English throne as James I. in 1603; but for above a century longer each country continued to be ruled by its respective parliament, the interest of the one often coming into collision with that of the other. After various fruitless proposals for a closer connection of the countries, the Scotch were, in 1702, prevailed on to send 20 commissioners to London, who, with 23 English commissioners, should deliberate on the terms of a union. Their proceedings, after being broken off, were resumed in 1706. The Scottish commissioners were at first disposed for a mere federal union, and objected to the proposed assimilation of customs, excise, and regulations of trade; but a majority were at last brought over to the views of the English commissioners; and the minority, with one exception, yielded. The union, though popular in England, was the subject of great dissatisfaction in Scotland, being regarded by the bulk of the community as a surrender of national independence to a powerful rival. Addresses against it were presented from all quarters, and in some places the people rose in arms, forming regiments of horse and foot to oppose it. The treaty was, however, after strenuous opposition, ratified by the Scottish as well as the English parliament, and ultimately completed on May 1, 1707. Its principal conditions were the incorporation of England and Scotland into the United Kingdom of Great Britain, the succession of whose monarchs was to be the same as that of England. There was to be one parliament, in which the peers of Scotland would be represented by 16 of their number elected each parliament, and 45 Scotch members were to sit in the house of commons. All rights and privileges were to be communicated between the subjects of both kingdoms, unless when otherwise agreed. The Episcopal church was confirmed in England, and the Presbyterian in Scotland. Scotland was to retain her courts of session and judiciary, and to have a separate seal for private rights and grants. While the parliament was to raise £2,000,000 by land-tax, Scotland would contribute £48,000 of that sum. The laws of trade, customs, and excise in Scotland were to be assimilated to those of England, and the coinage, weights, and measures of the two countries were to follow a uniform standard. In other matters the laws of Scotland were to remain in force, but might be altered by the parliament of Great Britain. The separate privy council of Scotland, which the act of union left untouched, was abolished the following year.

Ireland remained a distinct kingdom till 1801, when it was united with Great Britain into the United Kingdom of Great Britain and Ireland. By the terms of the union the separate parliament of Ireland was done away with, and Ireland was represented in the parliament of the United Kingdom by 4 lords spiritual and 28 lords temporal in the house of lords, and 120 members of the house of commons. Power was reserved to the sovereign to create one peer of Ireland for every three extinct peerages, and when the peerage of Ireland became reduced to 100, to create one peerage for each one that became extinct, so as to keep the peerage of Ireland up to 100, over and above those Irish peers who are also peers of England or Great Britain. The churches of England and Ireland were united into one Protestant Episcopal church. The subjects of Ireland were placed on the same footing as those of Great Britain in respect of trade and navigation, and in all treaties with foreign powers; and the law-courts of Ireland were to continue, subject to the regulations of parliament; writs of error and appeals being decided by the house of lords of the United Kingdom.

UNION, a co. in s. Arkansas, having the Ouachita river for its e. boundary; 1050 sq.m.; pop. '80, 13,417—13,384 of American birth, 6,433 colored. Co. seat, El Dorado.

UNION, a co. in s.e. Dakota, separated from Iowa by the Big Sioux river, and from Nebraska by the Missouri; about 375 sq.m.; pop. '80, 6,813—4,779 of American birth, 11 colored. Co. seat, Elk Point.

UNION, a co. in n. Georgia, containing a range of the Blue Ridge; 350 sq.m.; pop. '80, 6,431—6,429 of American birth, 110 colored. Co. seat, Blairsville.

UNION, a co. in s. Illinois, having the Mississippi river for its w. boundary, separating it from Missouri; 400 sq.m.; pop. '80, 18,102—17,428 of American birth, 269 colored. Co. seat, Jonesborough.

UNION, a co. in e. Indiana, bounded on the e. by the state-line of Ohio; 168 sq.m.; pop. '80, 7,673—7,383 of American birth, 136 colored. Co. seat, Liberty.

UNION, a co. in s. Iowa; 432 sq.m.; pop. '80, 14,980—13,425 of American birth, 92 colored. Co. seat, Afton.

UNION, a co. in w. Kentucky, having the Ohio river for its w. and n.w boundary, separating it from Indiana and Illinois; 430 sq.m.; pop. '80, 17,808—17,502 of American birth, 3,163 colored. Co. seat, Morganfield.

UNION, a parish in n. Louisiana, having the Ouachita river for its e. boundary; 1100 sq.m.; pop. '80, 13,526—13,473 of American birth, 5,510 colored. Co. seat, Farmersville.

UNION, a co. in n. Mississippi; 440 sq.m.; pop. '80, 13,030—13,010 of American birth, 3,090 colored. Co. seat, New Albany.

UNION, a co. in n.e. New Jersey, having Newark bay and Staten Island sound for its e. boundary; about 100 sq.m.; pop. '80, 55,571—43,146 of American birth, 1947 colored. Co. seat, Elizabeth.

UNION, a co. in s. North Carolina; 600 sq.m.; pop. '80, 18,056—18,041 of American birth, 4,494 colored. Co. seat, Monroe.

UNION, a co. in central Ohio; 440 sq.m.; pop. '80, 22,374—21,573 of American birth, 403 colored. Co. seat, Marysville.

UNION, a co. in n.e. Oregon, separated from Idaho by the Snake river, and containing a range of the Blue mountains; about 4,500 sq.m.; pop. '80, 6,650—6,055 of American birth, 249 colored. Co. seat, La Grande.

UNION, a co. in central Pennsylvania, having the w. branch of the Susquehanna river for its e. boundary; 280 sq.m.; pop. '80, 16,905—16,727 of American birth, 133 colored. It is crossed by several ridges of the Alleghany mountains. Co. seat, Lewisburg.

UNION, a co. in n. South Carolina, having the Broad river for its e. boundary; 600 sq.m.; pop. '80, 24,081—24,025 of American birth, 13,556 colored. Co. seat, Union.

UNION, a co. in e. Tennessee, intersected by the Clinch river; 260 sq.m.; pop. '80, 10,261—10,257 of American birth, 216 colored. Co. seat, Maynardville.

UNION COLLEGE. a seat of learning at Schenectady, N. Y., incorporated in 1795, chiefly by the efforts of gen. Philip Schuyler, a distinguished officer of the American revolution. It was named Union from its being established by the co-operation of several religious denominations. Its first president was John Blair Smith of Philadelphia, who was succeeded in 1799 by Jonathan Edwards, the younger; but its great prosperity and usefulness have been secured under the presidency of rev. Elihu Nott, from 1804 until his death in 1865. By his zeal and enterprise, it was endowed, and equipped with buildings, library, and natural history cabinets. It has 18 professors and 175 students. In 1873 a school of engineering, a medical college (with a 120 students), and a law school (with near 100 students), were associated with the Union college, now known as Union university.

UNION GOODS, a general name for such textile fabrics as are composed of more than one material; but it is applied chiefly to those made from vegetable fibres, as mixtures of flax and hemp, or jute, cotton and flax, etc. This class of manufactures has immensely increased of late years.

UNION IDÆ. See FRESH-WATER MUSSEL.

UNION-JACK (from the *jacque*, or surcoat, charged with a red cross, anciently worn by English soldiers—see JACK), the national banner of the united kingdom of Great Britain and Ireland, formed out of the combination of the crosses of St. George (argent, a cross gules), of St. Andrew (azure, a saltire argent), and of St. Patrick (argent, a saltire gules), these three crosses being the national banners of England, Scotland, and Ireland respectively. The first union-jack, which was introduced by a royal proclamation in 1606, three years after the union of the Scottish with the English crown, combined only the crosses of St. George and St. Andrew, and may be blazoned, azure, a saltire argent surmounted by a cross gules edged of the second. This combination was by royal proclamation of date July 28, 1707, constituted the national flag of Great Britain. On the union with Ireland, a new union ensign was devised, in which the cross of St. Patrick was introduced, with its four limbs edged with white on one side. This awkward specimen of heraldry forms the second and now existing union ensign. Generally speaking, it is displayed as a national ensign on flags only; but the reverse of the bronze coins of the realm contains a not very accurate representation of it on the shield of the seated figure of Britannia. The inaccuracy consists in the crosses of St. Andrew and St. Patrick being made to assume the appearance of a single saltire with a narrow border of equal width on each side.

UNION THEOLOGICAL SEMINARY, in New York, founded 1836. Its buildings were on ground extending from Greene to Wooster streets, between 6th and 8th streets, then quite on the outskirts of the city. A few weeks before, the great fire of 1835 had greatly reduced the resources of its friends, and, not many months after, the financial troubles of 1837 spread bankruptcy among them and through the land simul-

taneously with the ecclesiastical troubles which rent asunder the Presbyterian church. Yet, after a little delay, the erection of the needful buildings was secured. Thomas McAuley, D.D., president; Henry White, D.D., professor of theology; and Edward Robinson, D.D., LL.D., professor of biblical literature, constituted the faculty, assisted by several professors and instructors extraordinary. The famous Van Ess library, opportunely offered for sale in Europe at a small fraction of its value, was bought as a nucleus. When the act of incorporation was obtained, the word "Union" was added to the name, in the legislature, for distinction's sake, but without having been desired by the directors. It has since proved an honorable distinction in a sense not then contemplated. The early history of the seminary was a continued struggle with inadequate financial resources; but by numerous and liberal subscriptions, in some instances several times repeated, and by legacies, it has gradually become well endowed. Its vested funds and other property amount now to about \$1,250,000. Its library has increased from 13,000 vols. to 36,500 vols. and 38,000 pamphlets. The present location is about to be exchanged for one more suitable, and plans for the Morgan library and the Adams chapel are being made. During its first 40 years the institution sent forth 1778 students. Its faculty now consists of 6 professors and 1 instructor, and several courses of lectures are given on subjects by distinguished men specially appointed from time to time. The number of students for 1880-81 was 127.

UNION UNIVERSITY (UNION COLLEGE, *ante*), Schenectady, N. Y., founded 1795. It acquired by its charter full university powers, but until 1873 was known as Union college, the name having been suggested by the fact that several religious denominations co-operated in founding it. As organized under the new charter of 1873, the university embraces the several institutions of Union college, the Albany medical college, the Albany law school, and the Dudley observatory. The college was the first founded in New York w. of the Hudson river, and the first chartered after the establishment of the United States. The endowment of the university, in lands and bonds, is estimated at about \$700,000. Its income, from the nature of its property, is variable. Its buildings include two large dormitories, with a professor's residence at each end, and long extensions to the rear; a memorial hall, circular, domed, 90 ft. broad and 120 ft. high; a gymnasium; and three other collegiate residences. The university has 240 acres of ground within the city limits, including farm land, groves, and large garden. It has a large and well-appointed laboratory; a large cabinet in natural history, rare in some specialties, and containing some statuary, some superior casts, many photographs, heliotypes, etc. The library has 20,000 titles. The regular course of study is substantially the same as in other colleges of the first-class. The department of art and general culture is designed to furnish such instruction in belles-lettres and art as will contribute to the general culture of the student. It is proposed to give the student a knowledge of the facts and philosophy of history, both by lectures and recitations. The elements and history of mental and moral science are taught by the use of text-books, with oral explanations and illustrations. During the senior year, there is given by the president a course of instruction upon the claims and evidences of revealed religion, and upon natural theology and Christian ethics. The medical lectures of the Albany medical college are free to all Union college students; and matriculation is granted to Union college graduates without examination. The school of civil engineering was founded in 1815. The course of study in this department occupies four years. Instruction in mathematics, natural philosophy, and chemistry is thorough. There are scholarships for the benefit of indigent students, and many prizes are bestowed for the highest proficiency in various studies. Special instruction is given in the oriental languages. The medical college was established in 1838, and its museum is one of the best of its kind in the country. The law school, organized, 1851, is vigorously administered. The Dudley observatory, founded by Charles E. Dudley, is well equipped, and offers many advantages to students. It is the distributing center for the United States signal service. The college faculty consists (1880) of 14 professors, 5 instructors, and 6 lecturers. The medical college has 16, and the law school 8, professors. Students in 1879—college, 231; medical college, 153; law school, 80. Total, 464. President, Eliphalet Nott Potter, D.D., LL.D.

UNITARIANS, a name applied generally to all who maintain that God exists in one person only, and specially to a small Christian sect of recent times, whose distinguishing tenet is the unity as opposed to the trinity of the Godhead. In the more general sense, the name of course includes the Jews and the Mohammedans as well as those Christians who deny the doctrine of the trinity, and in this sense also there have been Unitarians from the earliest period of ecclesiastical history. Until the middle of the 2d c., there seems to have been no controversy upon the subject; but from that time to the end of the 3d c., there was a succession of eminent teachers who maintained, against the ecclesiastical doctrine of the Logos, the undivided unity—or, as they expressed it—the *monarchy* of God. From their use of this word, they are known in ecclesiastical history as the Monarchians. There are generally understood to have been two classes of them—those who taught that Christ was God in such a sense that it was the Father who became man, and was born and suffered, and who were, on this account, called by their opponents Patripassians; and secondly, those who held that

Christ was in nature a mere man, but exalted above all other prophets by the superior measure of divine wisdom with which he was endowed, and who therefore corresponded more nearly with the modern Unitarians. It is right to notice, however, that the doctrines of the Monarchians are known to us only through the statements of opponents, and it is probable they would have disowned the more extreme views ascribed to them. To the former of the two classes we have mentioned belonged Praxeas, against whom there is a treatise by Tertullian, and Noetus; and at a later period—about the middle of the 3d c.—the famous Sabellius taught very similar doctrines. The other class was represented by Theodotus, Artemon, and especially Paul of Samosata, bishop of Antioch, who was eventually deposed on account of his heresy. Beryllus, bishop of Bostra in Arabia, who is said to have been convinced of his error by Origen, would seem, from the single sentence which records his teaching, to have belonged to this class rather than the other. The Monarchians appealed in support of their doctrines to the Old and New Testaments, and to the early opinions of the church. They are said, by Tertullian, to have consisted of the simple and the unlearned—"always," he adds, "a majority of the faithful"—a statement which shows that they must have been tolerably numerous in his time; while a writer quoted by Eusebius brings against them the apparently opposite charge of being students of geometry and lovers of Aristotle.

The grand theological struggle which followed in the 4th c. between the Arians and the Athanasians may be regarded as but another phase of the Unitarian controversy, inasmuch as Arius held that the Son was a created being, and denied his consubstantiality with the Father. On this head, the reader may consult the articles **ARIUS** and **ATHANASIUS**. We now pass on to the post-reformation period.

It is not strange that in the great stir of thought which accompanied the reformation, some should have been found bold enough to question the grand Catholic doctrine of the trinity. Such there were even before the Socini. See **SOCINUS**. Among the earliest may be mentioned Hetzer and Bassen, both of whom were executed in 1529, the former, however, not exclusively for his religious opinions; Denck, Campanus, and the famous Spaniard, Michael Servetus (q.v.). So widely, indeed, was the Unitarian doctrine diffused that it was thought necessary, in the first article of the Augsburg confession, to condemn the modern Samosatans, who deny the personality of the Word and Spirit, declaring the former to be a proper spoken word, and the latter a divine influence; and as early as 1527, one Andr. Althamer published a work against "the modern Jews and Arians under a Christian name, who deny the deity of Christ." Under the influence of the elder Socinus, Unitarianism gained many adherents in Venetia. Poland and Transylvania, however, became its principal strongholds; and in those countries, favored by circumstances, it struck the deepest roots. In Poland, the nobility, protected from persecution by their class privileges, proved singularly favorable to a movement which seemed more destructive of the traditions of the Catholic church than any that had yet been entered upon; the Unitarian refugees from other countries found here a ready welcome; and in the reign of Sigismund II. (1543-72), this party of reformers was strong enough to form itself into a separate church. At a rather later period, Poland was the principal field of labor of the younger Socinus, and Unitarianism continued to flourish there until the middle of the 17th c., when, under John Casimir, who before his elevation to the throne had been a cardinal and a Jesuit, it was extirpated by force. In Transylvania, the Unitarians have succeeded in maintaining their existence, notwithstanding much opposition and persecution, from the reformation to the present day. The first who openly preached Unitarianism in that country were George Blandrata and Francis Davidis (1565), and under the influence of these distinguished men, large numbers, including the king himself, embraced the new opinions. But this period of prosperity was not of long duration. In 1572, though still permitted to worship according to their conscience, the Unitarians were forbidden to make any attempts at propaganda, or even to print their religious books. They were not, however, subjected to any violent persecution until after the incorporation of Transylvania with the Austrian empire, which took place in 1690; but after that time they were robbed by the Roman Catholics of all their churches and church property, forbidden to build new churches without the permission of the emperor, and by degrees excluded from all government offices, even the very lowest. On the accession of Joseph II., happier times returned. Their churches were forbidden to be seized, and an indemnity was even paid them for the loss of the cathedral church of Klausenburg. They were now enabled to build new churches, and their cathedral and college at Klausenburg are said to be still two of the finest buildings in that city. The Unitarians of Transylvania number about 60,000, and are said to be increasing. They have an organized system of church government, with a bishop at its head. They have three colleges—that of Klausenburg, with 12 professors and 273 students; that of Torda; and that of St. Keresztur.

In England, Unitarian opinions were somewhat later in making their appearance than on the continent. As early, indeed, as 1548, a priest named John Ashton was accused of Arianism, and escaped with his life only by recantation; and during the reigns of Edward VI., Mary, Elizabeth, and James I., a few suffered martyrdom on similar charges. But during the reign of James I., continental Socinianism began to exercise considerable influence in England, and continued to do so to the end of the century, so

much so that, in 1665, Dr. Owen wrote that "the evil is at the door, that there is not a city, a town, scarce a village, in England wherein some of this poison is not poured forth;" and how deeply the church of England was infected with it may be inferred from the no doubt exaggerated statement of Palmer, who, in 1705, spoke of "troops of Unitarian and Socinian writers, and not one dissenter is found among them." Many eminent men of the time, including Milton, Locke, and Newton, and in the next century, the famous apologist, Lardner, must be numbered among the Unitarians; but it was in the last decade of the 17th c. that the controversy on this subject was most active, and at this time were published the old Unitarian tracts—a series of anonymous writings marked by eminent learning and talent. Hitherto, however, the Unitarians, with the exception of the society formed in London by John Biddle (q.v.), which did not survive its founder, had no organized existence. But after the passing of the toleration act in 1689, whereby non-conformity was made legal, the way was prepared for that gradual change by which the orthodoxy of the English Presbyterians passed into Unitarianism. It was at this time that most of the old Presbyterian chapels were founded, and the trusts being open—i.e., not committed to any doctrinal system—ministers and people were left free to adopt and promulgate whatever new opinions should approve themselves to their conscience. Thus the Unitarians are the legitimate successors and representatives of the 2,000 Presbyterian divines who in 1662 left the church of England in consequence of their inability to comply conscientiously with the terms of the act of uniformity. The ground of this separation, it should be understood, was no difficulty about the doctrinal articles of the establishment. The English Presbyterians (so called from their preference for that form of church government, for they were never able to adopt it) were originally as orthodox as their Episcopal brethren; but having refused to commit themselves to any authoritative creed, they underwent a gradual change to Arian, and at length to Unitarian views. Many preached such views without exciting attention or controversy, and indeed, until 1813, the law which made it blasphemy to speak against the Trinity, though not strictly enforced, was still in existence. During the latter half of the 18th c., Dr. Priestley (q.v.) appeared as the champion of the humanitarian view of Christ's nature, and, by the influence of his writing, secured the more open advocacy of that doctrine. In 1773 Dr. Lindsey resigned his charge in the church of England, and became pastor of the Unitarian congregation of Essex street, London—an event which may be regarded as an epoch in the history of English Unitarianism. In 1813 the Unitarians were placed by law fully on a par with other dissenters, and since that time there has been no attempt at persecution, with the exception of the claim made to some of their properties by certain orthodox dissenters. This claim was met by the dissenters' chapels act in 1844. The Unitarians of England and Wales are purely congregational in their church government, their only organ for combined action being the British and foreign Unitarian association, which holds its meetings annually in London. Their principal place of education is Manchester new college, London, which is, however, an unsectarian institution. They have also a missionary college in Manchester, and the Presbyterian college, Caernarthen, educates Independent and Unitarian ministers. They have at present about 350 chapels and 80 mission stations.

In Scotland the religious atmosphere has never been very favorable to Unitarianism. It was in that country that the last execution for blasphemy against the Trinity took place in the person of the unfortunate Aikenhead. Nevertheless, toward the close of the 18th c., there was a certain amount of Arianism among the moderates in the church of Scotland. Unitarianism, as a distinct system, was preached at Montrose as early as 1783; and, at the beginning of the present century, some attempts were made to diffuse it by means of missionary efforts. There are now seven congregations in the country. That at Edinburgh was originally a branch from the Cameronians, the strictest of Calvinists, but having adopted the principle of free inquiry, they gradually embraced Arian, and eventually humanitarian views. This last change took place during the ministry of the late Dr. Southwood Smith, about the year 1812.

In Ireland the history of Unitarianism is intimately connected with that of Presbyterianism. It flourishes principally in the n. of the island, where there is a strong infusion of Scotch blood, and where Roman Catholicism has the least influence. In 1871 there were 9,373 Unitarians in Ireland. The Unitarians of Ireland are Presbyterians in fact as well as in name.

Unitarianism in the United States has passed through much the same phases as in Great Britain. After 1740 Arian views of the person of Christ were pretty widely diffused among the New England clergy; and in 1787 took place the first secession from the Episcopal church, on the ground that those parts of the liturgy which imply a belief in the Trinity could not be any longer employed. From the first, the New England churches were remarkably free from the restraints of tests and creeds, and were thus prepared for the adoption of a liberal theology. By imperceptible degrees, many of them glided into Unitarianism; but it was not until about 1815 that the name began to be much used. At that time, the influence of Dr. Channing (q.v.) was thrown into the scale, and since then, Massachusetts, and particularly Boston, has been the stronghold of Unitarianism in America. The Unitarians have 362 societies in the states, and upward of 25 in Boston alone. Harvard university, Cambridge, is not a denominational institution; but it is at present in the hands of the Unitarians, and most of their

ministers are educated either there or at the Meadville theological school, Penn. Besides the Unitarians, properly so called, the Universalists, the "Christians" of America, and the Hicksite Quakers, are understood to hold anti-Trinitarian sentiments, though they give no special prominence to the doctrine of the divine unity. When we have mentioned, further, that there are a few Unitarian churches in the principal colonies of Great Britain, we shall have made a sufficiently complete enumeration for the purposes of this sketch. We have, however, to add, that Unitarian sentiments, under the names of liberal Christianity and rationalism, are more or less widely diffused in France, Switzerland, Germany, and Holland.

We now proceed to give a brief sketch of the theological opinions by which Unitarians are distinguished from other Christian sects. It is, of course, impossible that we should notice all the phases of belief they have passed through since the reformation. We confine ourselves to stating the more important doctrines of the early Socinians, as they are set forth in the Racovian Catechism, and sketching rapidly the opinions of the modern Unitarians of England and America.

The Socinians assumed, as the fundamental principle of their theology, the sufficiency of Scripture, or rather of the New Testament, which they held, had, for all matters of faith, superseded the Old. According to their system, Christ was a true man, but conceived of the Holy Spirit; and on account of the divine power which he has received from the Father, and his exaltation as head over all things, he is to have worship offered to him. The Holy Spirit is not a person, but a divine influence. The Socinians rejected also the doctrine of original sin. Man, they taught, was created with a mortal nature, but by the special gift of God, was endowed with a conditional immortality. He was created innocent, but not positively righteous. The gift of immortality he forfeited by disobedience. The fall of Adam, however, being a single act, could not deprave his own nature, much less that of his posterity; and in the latter, death was not a consequence of the fall, but was simply the condition of birth and life. Thus, the actual consequence of Adam's fall was not any radical corruption of human nature, whereby it was impossible for man to do any good thing, but rather a moral deterioration, producing, with repeated acts of disobedience, an increasing tendency to sin. Man, after the fall, retained his free will, and the power of abstaining from sin if he so pleased. On the question of the merits of Christ, the Socinian doctrine was essentially different from that of all the other Protestant sects. Christ's merits did not consist principally in his death, but in his life, his teachings, and his example. Nor was his death regarded as an atoning sacrifice, or as having any vicarious efficacy whatever, but simply as a confirmation of God's will, and the seal of the new covenant. Christ died for our sins—first, that all sinners might in this way have the assurance of forgiveness and of eternal life; secondly, that they might be drawn to Christ, and led to seek through him alone remission of their sins; and thirdly, that God might thus testify his boundless love to the human race, and might reconcile it to himself. But the crucifixion was important chiefly as preparing the way for the great crowning miracle of the resurrection. Here, in fact, not Christ's death, but his resurrection, is the central point of the Christian scheme. By this he confirmed his doctrine of immortality, and prepared for his ascension into heaven, where he now fills the office of our great high priest. Jesus "frees us from the punishment due to our sins, in that he continually protects us by the virtue and power which he has received from the Father, and by his intervention, defends us, as it were, from the wrath of God; and he frees us from servitude to our sins, by drawing us away from every kind of vice, and showing us in his own person the reward of him who abstains from sin." Predestination in this system means the decree of God, made before the foundation of the world, that they who believed and were obedient should be saved, and that they who believed not and were disobedient should be damned. Justification takes place when God pardons our sins and gives us eternal life. The Socinians regarded the sacraments as simply external signs testifying to Christian faith. Hence they held infant baptism to be irrational as well as unscriptural, but thought that a custom so old and established should be tolerated.

It need scarcely be said that the systematic theology of the early Socinians is in this country quite a thing of the past; indeed, the English Unitarians, though undoubtedly more or less influenced by their continental brethren of the reformation period, have with the latter no very direct historical connection. They seem rather to have arrived at independent conclusions, through their "rational" interpretation of Scripture, and their consistent rejection of human authority in matters of faith. The Unitarians of the present day, like almost all Christian sects, must be divided into two classes—a conservative and a progressive class—or, as they are often called, an old and a new school. The former adopt the old rule of the sufficiency of Scripture, though with many such qualifications as the scientific criticism of the Bible has rendered indispensable. The most conservative Unitarians, for example, would not contend for the literal truth of the first chapter of Genesis, nor for the doctrine of verbal inspiration in any shape. The Bible is *not*, but it *contains*, the Word of God, is the form which best expresses their position on this subject. They generally hold the simple humanity of Christ, and even reject the supernatural birth, thinking the parts of the gospels which record that event to be less authentic than the parts referring to the ministry, the death, and resurrection of Jesus. To the death of Christ they ascribe much the

same kind of efficacy as we have seen was ascribed to it by the Socinians, regarding his teaching and example as the most essential part of his work, and his death as an attestation to the truth of his mission, and a preliminary to his resurrection. What, however, chiefly distinguishes the Unitarians of this school from those of the new or progressive school, is the place which they give to the miracles as supernatural sanctions of the truth of Christianity. In this respect they must be considered as still under the influence of Locke's philosophy and the theology of Dr. Priestley. Denying that man has any immediate knowledge or intuition of spiritual things, they regard Christianity as a system of moral and religious truth external to man's nature, and requiring, in proof of its divine origin, certain evidence beyond its inherent credibility and adaptation to human wants. This evidence they find in the miracles, which they accept as well-attested facts, on the same ground on which all historical facts are accepted. "If there be any truth in history," says Dr. Priestley, whose influence can still be traced in the Unitarians of this school, "Christ wrought unquestionable miracles, as a proof of his mission from God; he preached the great doctrine of the resurrection from the dead; he raised several persons from a state of death; and, what was more, he himself died and rose again in confirmation of his doctrine. The belief of these facts I call the belief of Christianity." According to this view, therefore, Christ is an ambassador from heaven to earth; the miracles he wrought are his credentials; and the moral and religious truths which he taught are his message. It is not indeed denied that many or all of those truths might be learned from the light of nature, but they have received from Christianity a sanction which gives them a greater degree of certainty than they could otherwise possess. The Unitarians of the progressive school, on the other hand, have abandoned the philosophy of Locke for more spiritual modes of thought. So far from regarding man as entirely dependent upon his reasoning powers for his knowledge of religion, they rather look upon him as standing in a living relationship with the one infinite source of all truth, and as having within his own nature the germs of the highest religious faith. Christianity, accordingly, they regard not as a *message* or a system of truth communicated and authenticated from without, but as the highest expression of the divine in humanity—an expression not necessarily preternatural, but connected with the previous history of mankind by the natural laws of moral and spiritual development. To this view of Christianity, the miracles are not felt to be essential as proofs; and the truths of the gospel are thought to be quite unaffected by any judgment regarding them. The Unitarians, however, of this school, while, from their point of view, they regard the question of the miraculous as one of critical rather than religious interest, yet generally accept the miracles as historical facts, considering that there is sufficient evidence to prove that they took place. A few, but an increasing number, agree with Theodore Parker and many of the German critics in rejecting them, on the twofold ground that they are intrinsically incredible, and that the evidence for them is conflicting and uncertain. Generally speaking, the Unitarians of this school, like the so-called Broad-church men, are disposed to regard with favor the freest criticism of the Bible. Holding that inspiration is a quality which is not peculiar to the Bible, but common to all the most elevated religious literature, and that it in no case implies immunity from error, they maintain that the Scriptures must be subjected to the same rules of criticism and interpretation as any other book, and that each book of Scripture is to be studied not as a collection of infallible oracles, but as a record of the mind of the age in which it was produced. In this light, however, and also as a record of the grandest religious movements of the world's history, they hold the Bible in the highest estimation. Such is a statement, necessarily imperfect, of the peculiarities of the two Unitarian schools in their extreme divergence from one another; it need scarcely be added that in fact they merge into each other by imperceptible gradations.

It will, of course, be understood that the Unitarians of all shades of opinion are agreed in rejecting the entire orthodox scheme—including the doctrines of the Trinity, the vicarious atonement, the deity of Christ, original sin, and everlasting punishment—as both unscriptural and irrational. They celebrate the Lord's supper in their churches, not as a sacrament, but as a service commemorative of Christ's death, and expressive of spiritual communion with him. They also adhere generally to the rite of infant baptism, though there are a few Unitarian Baptist churches. In recent years, the Unitarians have given renewed prominence to the principles of comprehension and of free inquiry apart from the restraints of theological creeds, conceiving that in this they are conforming to the spirit of their Presbyterian forefathers; and many even object to the name Unitarian, as one which might be held to imply a doctrinal bond of union, and to be, to that extent, inconsistent with the fundamental principles of the body, which both now and in former times have always included unrestricted freedom of religious thought. It is impossible here to explain at greater length the Unitarian position; but it may be mentioned, as an important fact, that, when, at the meeting of the British and foreign Unitarian association in 1866, it was proposed to add to the rules a clause defining "Unitarian Christianity," the motion was almost unanimously rejected. The motion was intended as a protest against anti-supernaturalism. Its rejection, on the other hand, was an assertion of the principle of comprehension and freedom, and was voted for by those who sympathized doctrinally with the proposer, as well as by those who differed

from him.—For fuller information on the history and doctrines of the Unitarians, the reader may consult Dr. Beard's *Unitarianism in its Actual Condition*; the rev. J. J. Tayler's *Religious Life of England*; Otto Foek's *Socinianismus*; and Lange's *Geschichte und Lehrbegriff der Unitarier vor der Nicänischen Synode*.

UNITARIANS (*ante*), first appeared, organically, in the United States in King's chapel (now "Stone chapel"), Boston, the first Episcopal church established in New England—where Mr. James Freeman, having been appointed a "lay reader" avowed Unitarian sentiments, inducing the congregation to declare themselves independent, alter the liturgy (1785), and ordain him, by the action of their wardens and vestry, as their pastor (1787). He ministered to them about fifty years. During this time other ministers, some of them in Harvard college, embraced and preached different shades of the same views, until in 1812 a controversy on the subject arose, between Dr. Worcester and professor Stuart on the one side, and Dr. Channing and prof. Ware on the other. This produced a crisis among the churches of Boston and the vicinity that had remained nominally evangelical; many of them were rent asunder, and congregations avowedly Unitarian were formed. The American Unitarian association, organized in Boston, 1825, was designed principally to publish and circulate tracts and books. It has also given aid in building churches and sustaining preachers in this country, and has maintained a missionary in India in communication with the Brama Samaj and its thousand congregations. The first general gathering of American Unitarian ministers was at New York in 1865, where the question of adopting a creed was debated, but met with very little favor. Except the single tenet which their name indicates, there is little in which they are agreed. While some of their churches and ministers are divided from the evangelical by a scarcely visible line, others stand at the extreme of rationalism and naturalism. Their history, they say, is "a history of individual opinions rather than of organizations, or methods of action; it is biographical, not national; it takes the form of heresies, as they are called, rather than creeds; it is marked by protests rather than professions. It has been called by its opponents a system of negations; yet every negation implies an affirmation. The affirmations of the conference were that every man has a right to judge for himself, unbound by any set of articles; that while professing itself to be a Christian body, it left every one to decide for himself what Christianity is, i.e. to choose among the conflicting views of Christian doctrine and statement that which seemed to him to be true and right." "The stand taken by Unitarians," they say, "is for nature, for human nature, for everything that God has made, as being the manifestation of his will as truly as anything written in the Bible. Righteousness and not dogma is the everlasting condition of all welfare in this world and the next; the acceptance of Christianity is not the believing in a creed, but believing with the heart; Jesus Christ, himself, in his life and death, all dogmatizing apart, is the embodiment of his religion; he holds that supremacy in the beauty and power of his life which makes it of all that has appeared upon earth, the fittest to be imitated and followed; and the man who comes nearest to that is the best Christian." According to the *Unitarian Year Book*, there were in 1878, 358 churches and 401 ministers. Nearly 100 of the churches were without pastors. The denomination has much literary culture and wealth; it is socially select, but shows no such rapid growth as characterizes several of the evangelical denominations. This is due doubtless to its continual attitude of negation and protest, still the influence of this protest is traceable beyond the Unitarian bounds.

UNITED ARME'NIANS, that division of Armenian Christians who are under the ecclesiastical jurisdiction of the pope. The Armenian rite in the Roman Catholic church has a patriarch and primate in Cilicia, 4 archbishops at Constantinople, Aleppo, Diarbekr, and Lomberg, 2 *in partibus*, and 16 bishops. Their union was effected, 1314-44. They number 100,000, of whom 78,000 are in Turkey and Persia; more than 8,000 in Austro-Hungary; and 14,000 in Russian Caucasia and Siberia. In 1872 a part of the United Armenians of Turkey renounced the jurisdiction of the pope and joined the Old Catholics.

UNITED BRETHREN IN CHRIST, a church formed in 1760 among the Germans in Pennsylvania, by Philip William Otterbein, sent to America by the synod of Holland as a missionary. This church has often been confounded with the Moravians, with whom, however, it has no ecclesiastical connection. Otterbein commenced his labors at Lancaster, Penn., but removed to other places, and finally to Baltimore. He was a man of fervent piety, a remarkably effective preacher, and had great influence with the people. He held union-meetings, often in the woods, which were continued for several days. To one of these he invited all who had experienced a change of heart. Many came, among whom were Lutherans, Reformers, Mennonites, Moravians, and others. A Mennonite preacher—Martin Boehm—professing to have experienced what he called the new life, was present, and preached with great power. At the close of his sermon Mr. Otterbein embraced him, and said: "We are brethren." This was the origin of their name. These two labored together for 50 years, and as their converts multiplied and needed ministers, laymen were licensed to preach, and soon annual conferences were appointed for examining, licensing, and directing them in their work. The first annual conference was in 1800 at Baltimore; the first general conference, 1815. In 1875, 43 annual conferences, 4,010 churches, 1967 ministers, 136,076 members, were reported.

This church has 10 educational institutions in several western states. It has at Dayton, Ohio, a large printing establishment, which issues a number of periodicals and a variety of books in German and English. It has quarterly, annual, and general conferences, of which the latter is the highest, and meets quadrennially. Lay-delegates have been members since 1873. Bishops are elected for four years. No slave-holder, or member of secret society, or any one who manufactures, sells, or drinks intoxicating liquor is admitted to the church. Baptism is administered in the mode which the candidate prefers. Infant baptism is practiced. The theology of the United brethren is Arminian. Their service, formerly in German only, is now also in English. They have foreign missions in Germany and Africa.

UNITED EVANGELICAL CHURCH, established in Germany, 1817, by the union of portions of the Lutheran and Reformed churches. Such a union had been attempted without success in 1529, 1631, 1661, and by Frederick I. of Prussia, 1703-22. Frederick William I. published several decrees having the same object in view. It was favored also toward the end of the 18th c. by the progress of rationalism, which made many theologians of both churches indifferent concerning doctrinal controversies, because they had lost faith in the doctrines themselves. Schleiermacher proposed to establish an outward church-unity, leaving disputed points in scientific theology still open for discussion. At the tercentenary of the reformation in 1817 a visible union was established, limited, however, at first, as many of its advocates supposed, to a common church government, and a common celebration of the Lord's-supper. In this movement the government of Prussia has always been the leader. The clergy in Berlin having published a declaration in favor of it, the minister of the interior confirmed it, and issued a decree that the organization should be called the Evangelical Christian church. The Lord's-supper was to be celebrated by adhering strictly to the scriptural words of institution. The progress of the union was disturbed by the king's recommending the court liturgy to all the congregations of the kingdom; and when, in 1834, the royal decree ordered its introduction into all congregations—united and non-united—many strict Lutherans left the united church. During the rest of that reign the government endeavored to force them back, but Frederick William IV. having, in 1845, granted liberty of worship, they organized an independent Lutheran church; the rest of the old Lutheran, and the Reformed church, including about 10,000,000 persons, being nominally connected with the United Evangelical church. One party of these regarded the union as only an external subjection to a common church government, while in doctrine the churches might be Lutheran, Reformed, or united; a second party, comprising the chief theological faculties, built its doctrines on the Bible, together with the dogmas common to the Lutheran and Reformed symbols; and a third, rejecting the authority, both of the Lutheran and Reformed symbols, and professing to hold simply to the Bible, claimed the right of subjecting even its authenticity to critical inquiry. In 1846 the king convoked a general synod to complete the organization of the church; and the work, having been interrupted by the revolution of 1848, was resumed in 1856. A similar union of Lutherans with the Reformed has been accomplished in several other of the German states; while of the rest some are too exclusively Lutheran, and some too exclusively Reformed to warrant the attempt. In 1875 the United Evangelical church of all Germany had 26,718,833 members. A branch of this church was organized in the United States at St. Louis in 1840, and, after several divisions and reunions, now includes 7 synods, having, about 300 ministers and 40,000 members. As late as 1876 the German language was exclusively used in all its congregations.

UNITED GREEKS. See GREEK CHURCH.

UNITED PRESBYTERIAN CHURCH, the name of a religious body in Scotland, which was constituted in 1847 by the amalgamation of the SECESSION and RELIEF CHURCHES, whose origin and history we propose briefly to narrate.

The SECESSION CHURCH.—The causes which led to the formation of the secession church, in order to be thoroughly understood, would require to be unfolded at much greater length than our space permits. But some notice of them, however brief, is absolutely necessary. It is well known that the reformation from popery in Scotland was a very radical and decisive affair in regard to both the doctrine and government of the church. The people became strongly Calvinistic and Presbyterian; and after the accession of James to the English throne (1603), their attachment to their ecclesiastical system became stronger still. The efforts of that monarch to supplant it by Episcopacy proved unavailing, so far as the great body of the commons and gentry were concerned; but moved by various considerations, into which religious conviction entered only as a very subordinate element, many of the Scottish nobles adopted the church principles of their sovereign, and after the restoration (1660), supported the governments of Charles and James in their persecution of the covenanters. See COVENANTS; SCOTLAND; SCOTLAND, CHURCH OF. At the meeting of the Scottish estates in 1690, Episcopacy, which in Scotland had obtained a temporary supremacy under the rule of Sharp (q.v.) and Lauderdale, and had, besides, become synonymous with adherence to the house of Stuart, was abolished, and Presbyterianism re-established. One unavoidable consequence of this was the abolition of the *right of patronage*, for in a multitude, probably the great majority of cases, the exercise of this right would have placed the nomination to ecclesi-

astical benefices in the hands of Episcopalian landholders, and thereby imperiled the existence of a sound Presbyterian ministry. But although there were still many zealous Presbyterians in Scotland, especially among the peasantry, the spirit of the nation as a whole had gradually undergone a great, and, in the opinion of some, a disastrous change, so far as religion was concerned. A kind of torpor seized the upper and middle classes after the "glorious revolution," and earnestness growing unfashionable, was sneered at as fanaticism. A proof of the latitudinarianism of the times is the fact that some hundreds of Episcopalian curates were allowed to retain the parishes in which they had been arbitrarily stationed, on subscribing the *confession of faith*; and great numbers of laymen became elders in a church whose strict adherents they had themselves but recently hunted even to death. This obtrusion into the church of curates whom bishop Burnet describes as "the worst preachers I ever heard, ignorant to a reproach, and many of them openly vicious," produced, as may easily be conceived, a pernicious influence on the purity of ecclesiastical discipline; and in 1712, when the obnoxious *law of patronage* was restored, the triumph of the "court" or "moderate" party in the church may be regarded as complete. See MARROW CONTROVERSY. Violent settlements, effected by the agency of dragoons, now became frequent, and greatly irritated the people, whose petitions and appeals were almost invariably disregarded; and finally, in 1730, the assembly enacted that in future no reasons of dissent "against the determinations of church judicatures" should be entered on record. This attempt to gag the mouths of congregations was more than some could bear, and in Oct., 1732, the rev. Ebenezer Erskine of Stirling, in a sermon delivered in his capacity of moderator before the synod of Stirling and Perth, denounced in solemn and impassioned words the recent legislation and spirit of the church. A committee was immediately appointed to consider the matter, and reported rather vaguely but unfavorably at the ensuing meeting of synod, in consequence of which Mr. Erskine, after three days' "warm reasonings," was found deserving of censure by a majority of six. He immediately protested (as did also twelve other ministers and two elders), and appealed to the next general assembly, which sustained the decision of the synod, and ordered the rebuke and admonition to be administered "in order to terminate the process." Erskine, of course, had to submit to censure, but left a written protest on the table of the assembly, in which he declared his intention to continue testifying against the "defections" of the time. This protest was also signed by William Wilson, minister of Perth; Alexander Moncrieff, minister of Abernethy; and James Fisher, minister of Kinclaven. The assembly was indignant, and next day ordained "that the four brethren appear before the commission in August next, to express sorrow for their conduct, and retract their protest;" on pain of being suspended from their ministry. This they refused to do, and in consequence were declared "no longer ministers of the church" (Nov., 1733), whereupon they handed in a final written protest, in which, after referring to the "defections from our reformed and covenanted principles" of the "prevailing party," they protested that they were obliged to MAKE A SECESSION FROM THEM, and appealed unto the first free, faithful, and reforming general assembly of the church of Scotland.

This was the origin of the famous "Secession Church," which has made so deep an impress on the religious life of Scotland. At first composed of only four ministers, it rapidly began to gather strength. Little Christian societies were everywhere formed, which were gradually supplied with pastors either from the establishment, or from pious youths trained to the work of the ministry by Erskine and his friends. Erskine and his friends drew up a statement of their reasons for separation, which was published under the title of *A Testimony to the Doctrine, Worship, Government, and Discipline of the Church of Scotland, or Reasons (by the Four Brethren) for their Protestation entered before the Commission of the General Assembly*. This document, which afterward came to be known as the "First or Extra-judicial Testimony," presented in a polemical or argumentative form those facts in the later history of the church of Scotland at which we have already glanced; and is of great value with reference to a proper understanding of the grounds of secession. From it we learn that it was *not* one thing only, not even the unpopular "law of patronage" (as has sometimes been carelessly imagined and asserted), that induced Erskine and his friends to leave the church of their fathers; but an accumulation of grievances that in their eyes had become insupportable. In short, the Secession church had a *religious*, and not a *political* origin. What the "four brethren" sought was the vindication of what they held to be evangelical truth, much more than of the mere right of "popular election." So much popular indignation was excited by the deposition of the "four brethren," that it was thought desirable by the majority of the "Moderate party" to make certain concessions to the "Evangelicals," or "Marrow party," lest the spirit of insurrection should grow, and perhaps overturn the establishment. Accordingly, the general assembly of 1734 passed some measures distinctly favorable to the latter party, and curiously contrasting with their former procedure; and finally, on the last day of the sittings, empowered the "synod of Perth and Stirling" to remove the censures from the four brethren, and to restore them to their respective charges. This was done; and to show how far their new-born cordiality could go, the synod proceeded, in Mr. Erskine's absence, to elect him "moderator;" but Mr. Erskine declined to be "reponed," and gave his reasons in a letter to the Stirling presbytery, and in a pamphlet subsequently published. In Dec., 1736, appeared the pamphlet entitled *An*

Act, Declaration, and Testimony for the Doctrine, Worship, Discipline, and Government of the Church of Scotland, commonly known as the "Judicial Testimony," which is a sort of survey of the whole ecclesiastical history of Scotland from the reformation down ward, in which all the "instances of defection and relapse are marked and judicially condemned." In 1737 the rev. Thomas Mair of Orwell, the rev. Ralph Erskine of Dunfermline, the rev. Thomas Nairn of Abbotshall, and the rev. James Thomson of Burntisland, joined the original "four." The church authorities, filled with anger and alarm, now resolved to proceed to extremities against the seceders. In 1738 the "commission," obeying the injunctions of the assembly of that year, libeled the "Eight Brethren," and summoned them to appear before the assembly of 1739, which they did—having, however, first drawn up and passed an act entitled a *Declinature*, in which they disclaimed the authority of the established courts. One final effort was made by the assembly to bring them back to the bosom of the church, but it failed—the "brethren" adhering strictly to all their former protestations and testimonies; and after a "year of grace," the general assembly of 1740 solemnly pronounced their deposition, and the connection between Erskine and the church of his fathers was forever at an end.

It is not necessary to describe minutely the gradual extension of the "Secession movement" among the people of Scotland, but we may mention, that in spite of the frequent refusal of sites for churches, and other modes of persecution, the cause abundantly prospered; and after a few years, the "Secession Church" came to be recognized as a really important body, both from the number of its congregations, and the grave, serious, and solid character of its members.

In 1747 a rupture or "breach" took place in the new body on the question of the burghs-oath, some affirming that this oath could not be taken by any consistent seceder, and others insisting that it could, and that the question regarding it ought to be matter of mutual forbearance. The party condemning the religious clause in the burghs-oath formed the *General Associate Synod*, or popularly, the *Anti-burgher Synod*; the party tolerating it, the *Associate or Burgher Synod*. Subsequently, a second split occurred in each of these, and two other trivial denominations were formed, the one assuming the designation of the *Constitutional Associate Presbytery*, or *Old Light Anti-burghers* (1806); and the other, the designation of the *Original Burgher Presbytery*, or *Old Light Burghers* (1799). After holding aloof from each other for more than 70 years, the Burghers and Anti-Burghers began to approximate once more, and finally, on Sept. 8, 1820, in Bristo street meeting-house, Edinburgh, the synods of the two long separated branches of the Secession were solemnly reunited. At the date of the "breach" (1747), the number of Secession congregations was 32; when the reunion took place, it had increased to 262. Henceforward, the history of the Secession church exhibits a course of uninterrupted prosperity. A certain change, however, now begins to show itself in the character and spirit of the denomination. Hitherto, seceders had worn a sort of *old-world look*, if we may use these words respectfully; their thoughts and interests in matters ecclesiastical centered round bygone times and events; their very language, like their sentiments, was archaic, and fell coldly upon all but the devoutest ears. Now, however, the wants of the modern world made themselves felt even in the narrow circles of Scotch dissent. In a word, they came under the liberalizing influences of the new-born enthusiasm for foreign missions, and started "stations" in Canada, Jamaica, Trinidad, Calabar, etc. So vigorously was this important branch of Christian work carried on, that in 1847, at the period of the union of the Secession and Relief churches, the former was found to be supporting a staff of more than 60 missionaries in different parts of the world. Further, the *Secession* church began to assume an attitude more distinctly antagonistic to the establishment. Though it has never formally avowed the *voluntary* principle (see VOLUNTARIANISM), yet the fact that it has maintained itself *ab initio* by voluntary effort, has had the effect of determining the great majority of the pastors and people to adopt this principle. A variety of circumstances, partly political and partly ecclesiastical, led to a great controversy between leading divines of the Establishment and of the Secession, known as the *Voluntary Controversy* (1829-34), which served to strengthen the voluntarism of the seceders, and brought them more closely into connection with the Relief church (see below), whose theoretical voluntarism was perhaps still more pronounced. Next followed the famous *Atonement Controversy*, in which the Secession church signalized itself by an adherence to the liberal evangelical theology of the Marrow, and on this vital point also it had the sympathy and support of the Relief body. The desire for union between the two denominations now became stronger than ever. Committees were appointed, and conferences held; and at length on May 13, 1847, in Tanfield hall, Edinburgh, the union of the Secession and Relief was formally accomplished, and the two churches, abandoning the names by which they had hitherto been known, formed themselves into one body under the designation of the UNITED PRESBYTERIAN CHURCH.

We now revert to the RELIEF CHURCH, whose history and fortunes we shall briefly narrate. After the expulsion of Erskine and his friends from the church of Scotland, the assemblies (packed with "court of sessions elders") became more determinedly "moderate" than ever. The split that occurred among the seceders in 1747 convinced them that they had now little to fear from the aggressive zeal of their opponents, who had taken to quarreling among themselves; and, desiring to stand well with government

for various reasons, they boldly resolved to deprive the people of all right to elect, or in any way to interfere with the election of ministers. Never were forced settlements more shameless than about this period; but it has been well remarked, "there is a point at which oppression becomes intolerable; and to a religious people, no oppression is half so galling as that which is spiritual." *Relief* was felt to be a necessity, and relief came in the person of the rev. Thomas Gillespie, minister of the parish of Carnock, near Dunfermline. The circumstances which brought him into collision with the general assembly were these: In 1749, the rev. Andrew Richardson was presented to the parish of Inverkeithing by the patron, capt. Philip Anstruther; but the presentation proved so extremely unpopular that the presbytery of Dunfermline refused to proceed with it. In 1750, the case came before that high-handed body, the "commission of the assembly," who ordered the presbytery to proceed at once to induct Mr. Richardson. This mandate they firmly refused to obey; and when, after much discussion, the affair again came before the commission in March, 1752, it was resolved to transfer the onus of the unpopular settlement from the shoulders of the presbytery of Dunfermline to those of the synod of Fife. This compromise did not satisfy the out-and-out moderates in the church of Scotland. It was, therefore, resolved to make an example of the presbytery of Dunfermline at the ensuing assembly. On May 18, the "Inverkeithing case" came on, and after a brief but animated debate, the conduct of the "commission" was condemned by the assembly without coming to a vote; the presbytery of Dunfermline was ordered to induct Mr. Richardson on Thursday the 21st, and on the day following to appear at the bar of the assembly. The presbytery did *not* meet on Thursday—at least a *quorum* did not—and Mr. Richardson was consequently not inducted. On Friday, six ministers of the presbytery—Robert Stark, David Hunter, Thomas Gillespie, Alexander Daling, Thomas Fernie, and John Spence—handed in a "representation," explaining why they could not obey the commands of the supreme court. They were warned by the moderator of the danger in which they stood, and were finally informed that if they remained obdurate, *one* of them should be deposed. Next day, they were called in *singly*. Stark, Fernie, and Hunter all wavered and shifted their ground a little; Daling and Spence said nothing; but Gillespie was ready with a second "representation." This was enough. Gillespie was fixed on as the most suitable sacrifice, and almost without trial, without a libel or any formal process whatever, he was arraigned, cast, condemned, and deposed. The majority of the general assembly, corrupt as its composition undoubtedly was, seems to have shrunk from active participation in the deed. Out of 158 members present, only 56 ventured to vote, and these, it must be remarked, were mainly lawyers!

The *Relief Church*, it will be seen, was founded simply on an assertion of the right of congregations to elect their own ministers. In 1758, Mr. Thomas Boston, jr., minister of Jedburgh, and son of the great Boston, threw in his lot with Gillespie; in 1761, the congregation of Colinsburgh, in Fife, did the same. The relief had now got a footing; and steadily increased. "Societies" (as in the case of the seceders) sprang up everywhere, which were gradually formed into congregations, and obtained ministers from the Establishment, the Secession, the Reformed Presbytery, and the English Presbyterians; nevertheless, they had long to sustain a severe fire of attack from the Seceders and Reformed Presbyterians, on account of their firm adherence to the latitudinarian principle of "free communion," i.e., of holding Christian fellowship at the Lord's table with other denominations. It is unnecessary to prosecute the history of the Relief further than to state that at the union in 1847 it numbered 113 congregations, while the Secession numbered 384 congregations; so that the UNITED PRESBYTERIAN CHURCH commenced with 497 churches, and a membership estimated at more than 140,000.

UNITED PRESBYTERIAN CHURCH.—The career of this church as a corporate body has been one of uninterrupted prosperity, and scarcely more is necessary than to indicate its present attitude and condition. In point of doctrine, it adheres (like all the other Presbyterian churches of Scotland) to the Westminster confession of faith and the larger and shorter catechisms, "it being always understood that we do not approve of anything in these documents which teaches, or may be supposed to teach, compulsory, or persecuting and intolerant principles in religion"—a qualification supposed to refer more particularly to the 23d chapter of the confession of faith. Its form of church government is Presbyterian; but, unlike the Established and Free churches, it has no intermediate courts between presbyteries and the supreme court, the latter of which it does not call a general assembly, but only a synod; though, in point of fact, it partakes more of the nature of a "general" assembly than the bodies known by that name, since it is really an assembly of the whole clergy of the denomination, with one elder from each kirk-session. It has a theological hall and library in Edinburgh, and a staff of professors. The United Presbyterian church is also at present, not only in *practice*, but also in *theory*, a voluntary church. The voluntary principle, it is true, is not formally laid down in any portion of her standards, or "basis of union;" but a long experience of practical voluntarism has finally led, one may almost say, the whole body of United Presbyterians to the conviction that the interests of Christianity are best served by the total separation of the church from the state. Although inferior in point of wealth to the Established and Free churches, the United Presbyterian church has honorably distinguished itself by its general liberality and occasional munificence.

In the year 1875 about 100 congregations of the United Presbyterian church situated in England were transferred by the mother church in Scotland to the "Presbyterian church in England" (q.v.). Since the separation of its English branch the United Presbyterian church still counts about 530 congregations and over 172,000 members. Protracted negotiations for union between the United Presbyterian and Free churches have been without result.

UNITED PRESBYTERIAN CHURCH OF NORTH AMERICA, formed, 1858, by the union of the Associate and Associate Reformed churches.

I. *The Associate church* in the United States had its origin in the persecutions which drove parties of Scotch and Irish covenanters to the American colonies. In 1680 some of them settled at Port Royal, S. C., but were driven away by Spanish invaders. In 1750 the first minister of the Secession church of Scotland arrived in Philadelphia, and the Associate presbytery of Pennsylvania was formed. It soon had congregations in New York, Virginia, and the Carolinas. In 1776 the presbytery of New York was formed. In 1783 these presbyteries united with the Reformed presbytery in forming the Associate Reformed synod of North America. A small minority in both denominations were opposed to the union, and in them the Covenanter or Reformed and the Associate churches have been continued. The latter was increased by ministers from Scotland. In 1793 its first theological school was established in Beaver co., Penn. In 1798 the presbytery of Kentucky was formed, and the Associate synod of North America in 1801. In 1800 the presbytery of Pennsylvania declared slavery to be a moral evil, and unjustifiable; and in 1831 the synod excluded all slave-holders from its communion. This action led to the withdrawal of all the congregations in the southern states, but the loss was made up by accessions in western states. In 1858 the Associate synod included 21 presbyteries, 231 ministers, 293 congregations, and 23,500 communicants.

II. *The Associate Reformed church*. The Associate Reformed synod, formed 1783, organized itself in 1802 into a general synod, composed of the synods of New York, Pennsylvania, Scioto, and the Carolinas. In 1804 a theological seminary was established in New York city, with Dr. John M. Mason as prof. of theology. In 1820 the synod of Scioto withdrew from the general synod, and that of the Carolinas at its own request was set off as an independent body. In 1821 a union was formed with the general assembly of the Presbyterian church, but only a part of the denomination agreed to it. The synod of New York continued its separate existence, and in 1829 re-established the theological seminary at Newburgh. In 1855 it was united with the western synod (of Scioto), and the general synod of the Associate Reformed church was renewed, containing 4 synods, 28 presbyteries, 253 ministers, 367 congregations, and 31,284 members. They held to the Westminster confession, close communion, anti-slavery, and the use of only the psalms in praise.

III. In 1858 the Associate and the Associate Reformed churches were re-united under the name of The United Presbyterian church of North America. In addition to their adherence to the Westminster standards they have adopted a testimony against slavery and secret societies, and in favor of close communion, the exclusive use of the psalms in worship, and the duty of covenanting. They have three colleges, three theological and two missionary seminaries under their charge. In 1878 they reported to their general assembly, 9 synods, 56 presbyteries, 647 ministers, 792 congregations, 67 mission stations, 78,648 members, and about \$784,000 contributed for the support of the gospel at home and abroad.

UNITED PROVINCES. See NETHERLANDS.

UNITED STATES OF AMERICA, a federated republic, composed of 38 independent states, eight organized and two other territories, and a federal district, occupies the central portion of the continent of North America, from lat. 24° 20' to 49° n., long. 66° 56' to 124° 30' w., bounded n. by the British possessions of North America, from which it is partly separated by lakes Superior, Huron, St. Clair, Erie, and Ontario, and the St. Clair, Detroit, Niagara, and St. Lawrence rivers; e. by New Brunswick, the Atlantic ocean, and gulf of Mexico; s. by the gulf of Mexico and Mexico; w. by the Pacific ocean. Its greatest length, from the Atlantic to the Pacific, is 2,760 m.; greatest breadth, from Maine to Florida, 1600 m.; northern or British frontier, 3,350 m.; Mexican, 1500 m.; ocean coast, including the larger indentations, 12,609 m., of which 6,861 are on the Atlantic, 3,461 on the gulf of Mexico, and 2,281 on the Pacific. The territory of Alaska, long known as Russian America, between lat. 52° and 71° 27' n., and long. 130° 25', and 187° 36' w., now belongs to the United States.

The total area of the United States is 3,603,844 sq. m., or 2,306,460,160 acres, obtained by successive annexations of territory. In 1783 the United States had an area of only 820,680 sq. m.; by the purchase of Louisiana from France in 1803, it acquired 930,928; by the cession of Florida by Spain in 1819, 59,270; by the annexation of Texas in 1845, 247,000; by the Oregon treaty with Great Britain in 1846, 280,425; by the Mexican treaties, 677,260; and by the purchase of Alaska from Russia in 1867, 577,390 sq. miles.

The 38 states composing the federal republic, each having its constitution, legislature, executive, and judiciary, and represented in the federal congress by two senators, and

from 1 to 32 representatives, according to its population, are the following: Six eastern or New England—Maine, New Hampshire, Vermont, Massachusetts, Rhode Island, Connecticut; four middle—New York, New Jersey, Pennsylvania, Delaware; eleven southern—Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Alabama, Mississippi, Louisiana, Texas; seventeen western—Arkansas, Tennessee, Kentucky, Ohio, Indiana, Illinois, Missouri, Michigan, Wisconsin, Iowa, Minnesota, Kansas, California, Oregon, Nebraska, Nevada, and Colorado. The eight organized territories, governed by the federal congress, with governors and judiciary appointed by the president of the United States, but having a local legislature, and sending a delegate without a vote to congress, are New Mexico, Utah, Washington, Dakota, Arizona, Idaho, Montana, Wyoming. There is also the Indian territory, a reserve for Indian tribes, removed from the east of the Mississippi river, governed by the Indians, under the protection of the United States; the district of Columbia (60 sq.m.), ceded by Maryland, including Washington, the federal capital, governed by congress; and Alaska, under military rule.

The table annexed gives the date of the admission of the states to the Union, and the organization of territories, their areas in sq.m., and progressive population.

The states in the table designated as having been admitted 1787 to 1790, were the original 13 states, which at these dates adopted the federal constitution. A part of the original Virginia now forms the state of West Virginia. The states in which slavery existed in 1869 are in *italics*. By an amendment of the constitution, slavery was abolished, Dec. 18, 1865. The population given does not include the Indians or aborigines of the country, who are under the protection of the government, and who sparsely people the Indian reserves and unsettled territories. In 1870, there were estimated to be of Indians in the Indian territory, 59,367; New York, 5,144; California, 29,025; Oregon and Washington territories, 26,074; Utah, Nebraska, Kansas, Idaho, Montana, Dakota, Nevada, Colorado, Wyoming, New Mexico, and Arizona, 160,822; Alaska, 70,000; Michigan, Minnesota, and Wisconsin, 26,662; forming, with small numbers in other states, an aggregate of 383,712. Total estimated number in 1875, 320,000.

No country has been peopled by such a variety of races. New England was settled by English Puritans, and a few Scottish and Welsh; New York, by Dutch; Pennsylvania, by Quakers and Germans; Maryland, by English Roman Catholics; Delaware and New Jersey, by Dutch and Swedes; Virginia, by English cavaliers; the Carolinas, in part by French Huguenots; Louisiana, by French; Florida, Texas, and California, by Spanish; Utah, by Mormons, chiefly from England, Wales, and Denmark. Immigration from Ireland, Germany, England, Scotland, France, Switzerland, Sweden, has been large and progressive. In the year ending June 30, 1875, the total number of immigrants that arrived in the United States was 227,377. Of these there came from Great Britain and Ireland, 85,362; Germany, 47,760; China, 16,433. In 1875-76, the number of immigrants was 169,986. From 1815 to 1874, the emigration from Great Britain and Ireland to the United States was 4,965,262. The Germans and Irish, and their descendants, in the United States, probably form one-third of the entire populations.

Physical Character.—Though occupying the central portion of a continent, more than two-thirds of the frontiers of the U. S. are shores of lakes and oceans, with numerous bays and sounds, rivers and lakes. On the Atlantic coast are—Passamaquoddy bay, Penobscot bay, Casco bay, Massachusetts bay, Long Island sound, New York bay, Delaware bay, Chesapeake bay, Albemarle and Pamlico sounds, etc.; on the gulf of Mexico—Tampa bay, Apalachee bay, Pensacola bay, Mobile bay, Atchafalaya bay, Galveston bay, Matagorda bay, Corpus Christi bay, etc.; and on the Pacific—the channel of St. Barbara, bay of Monterey, San Francisco bay, Humboldt harbor, strait of Juan de Fuca, Puget's sound, etc., and the bays and sounds of Alaska. The principal lakes, besides those divided with British America, are lake Champlain, lake Michigan, Great Salt lake, Pyramid lake, Mono lake, lake Tulare, and many beautiful clusters of smaller lakes in Maine, New York, Minnesota, etc.

The rivers of the U. S. may be classed in four divisions: 1. The Mississippi and its branches (q.v.); 2. The rivers emptying into the Atlantic or its bays and sounds—the St. Croix, Penobscot, Kennebec, Merrimac, Connecticut, Hudson, Delaware, Susquehanna, Potomac, James, Roanoke, Neuse, Cape Fear, Pedee, Santee, Savannah, Altamaha, St. Johns, etc.; 3. Those, besides the Mississippi, emptying into the gulf of Mexico—the Chattahoochee, Alabama, Tombigbee, Pearl, Sabine, Trinity, Brazos, Colorado, Nueces, and Rio Grande; 4. Those emptying into the Pacific—the Oregon or Columbia, Sacramento, San Joaquin, Colorado, etc. Besides these, there are many small rivers emptying into the great lakes, and finding their outlet through the St. Lawrence; and the rivers which empty into the salt lakes of the great interior basin of Utah.

The chief mountains of America are those which belong to the great eastern chain of the Alleghenies (see APPALACHIANS) and the Rocky mountains (q.v.).—The geology of the U. S. will be found described under the titles NORTH AMERICA (*geology*), APPALACHIANS, ROCKY MOUNTAINS, and the several states and territories.—The soil is of every variety, from the sterile deserts of the great western plains and Utah, to the inexhaustible fertility of the bottom-lands of the Mississippi valley, where heavy crops of

STATES.	Ad- mitted.	Area in sq. miles.	Pop. in 1800.	Pop. in 1820.	Pop. in 1860.	Pop. in 1870.
EASTERN—						
Maine.....	1820	35,000	151,719	298,269	628,279	626,915
New Hampshire.....	1788	9,280	183,762	241,022	326,073	318,300
Vermont.....	1791	10,212	154,465	235,966	315,098	330,551
Massachusetts.....	1788	7,800	423,845	523,159	1,231,066	1,457,351
Rhode Island.....	1790	1,906	69,122	83,015	174,620	217,353
Connecticut.....	1788	4,750	251,002	275,148	460,147	537,454
MIDDLE—						
New York.....	1788	47,000	589,051	1,372,111	3,880,735	4,282,759
New Jersey.....	1787	8,333	211,149	277,426	672,055	906,036
Pennsylvania.....	1787	46,000	602,365	1,047,507	2,906,215	3,521,951
Delaware.....	1787	2,120	64,273	72,749	112,216	125,015
SOUTHERN—						
Maryland.....	1788	11,124	341,543	407,350	687,049	780,894
Virginia.....	1788	38,348	880,200	1,065,116	1,596,318	1,225,163
West Virginia.....	1862	29,000	.....	66,557	.....	442,014
North Carolina.....	1790	50,704	478,103	638,829	992,632	1,071,361
South Carolina.....	1788	34,000	245,591	502,741	703,708	705,606
Georgia.....	1788	58,000	162,686	340,985	1,057,286	1,184,169
Florida.....	1845	59,268	.....	.....	140,424	187,748
Alabama.....	1819	50,722	.....	127,901	964,201	996,992
Mississippi.....	1817	47,156	8,850	75,148	791,305	827,922
Louisiana.....	1812	41,346	.....	152,923	708,002	726,915
Texas.....	1845	274,356	.....	.....	604,215	818,579
WESTERN—						
Arkansas.....	1836	52,198	.....	14,255	435,450	484,471
Tennessee.....	1796	45,600	105,602	422,771	1,109,801	1,258,520
Kentucky.....	1792	37,680	220,965	564,135	1,155,684	1,321,011
Ohio.....	1802	39,964	45,365	581,295	2,339,511	2,665,290
Michigan.....	1837	56,451	.....	8,765	749,113	1,184,059
Indiana.....	1816	33,809	5,641	147,178	1,350,423	1,680,637
Illinois.....	1818	35,410	.....	55,162	1,711,951	2,539,891
Wisconsin.....	1848	35,924	.....	.....	775,881	1,054,670
Iowa.....	1846	55,045	.....	.....	674,913	1,194,020
Minnesota.....	1857	82,531	.....	.....	172,023	439,706
Missouri.....	1821	65,350	.....	.....	1,182,012	1,721,295
California.....	1850	188,981	.....	.....	379,994	550,247
Oregon.....	1859	95,274	.....	.....	52,465	90,933
Kansas.....	1861	81,318	.....	.....	107,206	364,399
Nebraska.....	1867	75,995	.....	.....	28,841	122,993
Nevada.....	1864	104,125	.....	.....	6,857	42,491
Colorado.....	1875	104,500	.....	.....	34,277	39,864
District of Columbia (established).....	1790	64	14,093	33,033	75,080	131,700
TERRITORIES—						
New Mexico.....	1850	121,201	.....	.....	98,516	91,874
Utah.....	1850	84,476	.....	.....	40,273	86,736
Wyoming.....	1868	97,883	.....	.....	.....	9,118
Dakota.....	1861	150,932	.....	.....	4,837	14,181
Montana.....	1864	143,776	.....	.....	.....	20,595
Idaho.....	1863	86,294	.....	.....	.....	14,999
Washington.....	1853	69,994	.....	.....	11,594	29,955
Arizona.....	1863	113,916	.....	.....	.....	9,658
Alaska.....	1867	577,390	.....	.....	.....	70,461
Indian Territory.....	.....	68,991	.....	.....	.....	68,152
Aggregate of states and territories.....	.....	3,903,884	5,309,427	9,633,822	31,443,321	38,696,984
Colored population.....	.....	.....	1,002,637	1,771,656	4,441,820	4,886,387

maize have grown for fifty successive years without manuring. The St. Lawrence basin is an elevated calcareous plain, fertile and well wooded. The Atlantic slope from Maine to New Jersey, e. of the Hudson, is hilly, and best adapted for grazing; more southerly, the coast-belt is low, sandy, in places swampy, with pine-barrens, the inland region fertile, and among the best in the country. The Mississippi valley is generally level, and prairie-land of unsurpassed fertility, with a rich mold, in places 25 ft. deep. North-west, the country rises to a high and sterile region, extending from 200 to 400 m. from the base of the Rocky mountains. The Texas slope has rich bottom-lands on the coast, a fine rolling fertile country, rising to a high plateau, dry and sterile, except in the river-bottoms. The Pacific slope is generally sterile, except the great valleys between the mountain-ranges, and bordering the rivers, which are of great fertility. Utah, with the exception of a few fertile spots, is a desolate untimbered region of salt lakes and land saturated with alkaline substances. The country e. of the Mississippi, except the prairies of Illinois and Indiana, was, at its settlement, heavily wooded, and there are still vast forests of valuable timber—beech, birch, maple, oak, pine, hemlock, spruce, walnut, hickory, ash, elm, etc.; and in the south, live oak, water oak, magnolia, palmetto, tulip-tree, cypress, cotton-wood, cane, etc. West of the 97th meridian stretches a vast region of almost treeless prairies; forests again occur in the Rocky mountains; and California, Oregon, and Washington territory have the largest timber in the world. The

flora and fauna will be found under the head **NORTH AMERICA** (*botany, zoology*), and the several states.

Climate.—For a particular account of the climate of the United States, we refer to the articles **RAIN** and **TERRESTRIAL TEMPERATURE**. It is remarkable for wide transitions of cold and heat, rain and drought, except in the peninsula of Florida, where the temperature varies but 12° Fahr., and western Oregon and Washington territory, where the climate is like that of England. With few exceptions, the summers are hot, both n. and s. the thermometer rising at times to 110° Fahr., and along the northern range of states sinking to -20° , and even sometimes as low as -40° . The whole Atlantic coast has a winter temperature 10° lower than that of western Europe in the same latitude. Thus, at New York, in the latitude of Madrid, the Hudson river is frozen, and the harbor at times filled with floating ice. The causes modifying the climates of the different portions of the states chiefly arise out of the physical features; of which the Rocky mountains, the gulf of Mexico, the Atlantic, and the lake system in the n. are the most prominent. On the w., from the shores of the Pacific to the Cascade mountains, one of the most important ranges of mountains in America, the climate resembles that of Great Britain more closely than that of any other country in the world, being mild and humid, with frequent showers at all seasons. But the great valley lying between the Cascade and the Rocky mountains is almost entirely a rainless district, because the westerly winds are drained of their moisture in crossing the Cascade mountains before arriving there. In winter, it is covered with snow, but in summer is dry and arid. Owing, however, to the copious streams poured down from the melting snow, it presents abundant facilities for irrigation, so that its capabilities and resources are great, if they were properly developed. The country e. of the Rocky mountains depends for its rain on the gulf of Mexico; and the rainfall there is distributed most in the low plains, and least on the plateaux and mountains. Hence over this extensive district southerly winds are warm and moist, and westerly and northerly dry and cold. The result is rapid alternations of temperature, such as are never experienced in western Europe, the temperature having frequently a range in the course of a day of 50° or 60° . In the New England states, the northerly and easterly winds are cold, moist, and chilly, accompanied with frequent fogs; otherwise the climate resembles that of Great Britain. The climate of the states surrounding the great lakes in the n. is mild and moist in summer as compared with the other northern states; but in winter, when the lakes are frozen over, a degree of cold is experienced greater, absolutely and relatively, than anywhere else in the states. This excessive cold is caused by the country being exposed in the n. to the full sweep of the polar current from the n.; but more particularly to its low-lying situation, thus forming, as it were, a vast basin into which is poured from all sides the cold, and therefore heavy, currents of air chilled by terrestrial radiation during the winter season.—The health of the United States varies with climate, elevation, etc. Swamps and river-bottoms in some regions, especially the more fertile, are malarious. The rice-swamps of Georgia and South Carolina are fatal to whites, but not to negroes. In vast tracts of new country, even the rolling and hilly, the disturbance of the soil causes intermittent fevers. Diseases of the lungs prevail in the northern and middle states, bilious fevers in the southern; in the western, intermittent and remittent bilious. In 1850, the average mortality was 1 in 72, varying rather widely in different regions, modified not only by climate, but by the presence of large towns, and by immigration and emigration. The deaths in Vermont, a rural New England state, were 1 per cent; in Florida, the most southerly, though increased by consumptive patients from the n. 1.06; Georgia, 1.09; Alabama, 1.18; Maine and Indiana, 1.30; Ohio and Texas, 1.46; Missouri, 1.50; Massachusetts, with numerous manufacturing towns, 1.95; Louisiana, with yellow fever, and a large floating unacclimated population, 2.31. Probably, no portion of the world is more salubrious than Vermont, and the eastern slope of the Alleghanies, Florida, the upper country around the gulf of Mexico, the head-waters of the Mississippi, California, and Oregon.

Mineralogy.—The United States are rich in mineral productions. Coal is found in every state except Maine, New Hampshire, Vermont, New Jersey, Delaware, South Carolina, Louisiana, Mississippi, Minnesota, Wisconsin, and Nevada. The area of this coal-measures is estimated at 300,000 sq. miles. The whole extent of the coal area in the United States has been divided into four principal coal-fields or tracts—viz., the Great Central Alleghanian or Appalachian coal-field, extending from Tuscaloosa in Alabama, through eastern Tennessee and Kentucky, western Virginia, Maryland, Ohio, Pennsylvania, and reappearing in New Brunswick and Nova Scotia. This field has been computed to cover within the United States an area of 50,000 to 60,000 sq. m., of which about 40,000 sq. m. are considered workable area. It is subdivided into eight minor divisions, productive of bituminous coal. The second coal field occupies the greater part of Illinois and Indiana, and in extent is nearly equal to the first. A third field covers a large portion of Missouri; and the fourth the greater part of the state of Michigan. The Chesterfield bituminous coal-field, a detached district of small area near Richmond, Va., contains the oldest-worked collieries in America, and for many years furnished the only supply of coal for the sea-board towns. The production of 1873-74 was 45,413,340 tons, three-fourths of which were produced in Pennsylvania alone. Connected with the coal fields are the petroleum springs, which form a source of great

wealth to many localities. The exports of petroleum to Britain alone, in 1875, amounted to £770,488. See *НАПРѢА*. Beds of rich marl are found in several of the eastern states, and in many, nitrates and carbonates of soda and potassia, gypsum, and marble of great variety and some of rare beauty. Iron is found everywhere, from the pure metal in mountain masses, to bog-ore; and in many places in close proximity to coal. Lead exists in rich deposits in Missouri, Arkansas, Illinois, and Iowa. Copper is found in several states, and in great quantities of ores of 71 to 90 per cent. on the borders of lake Superior. Zinc exists in considerable quantities in New Jersey and Pennsylvania. Tin has been found in Maine and California. Silver is found in lead and copper, and in rich silver mines in New Mexico, Arizona, California, Utah, and Nevada. Gold is found in small quantities in the eastern states; in larger deposits in Virginia, North and South Carolina, and Georgia; and in great quantities in California, Oregon, Colorado, Nevada, and Washington, Arizona, New Mexico, and Montana territories. There are also found platina in small, and mercury in large quantities in California, osmium and iridium in Oregon, cobalt in North Carolina and Missouri, and nickel in Connecticut and Pennsylvania.

Agriculture.—With an abundance of fertile land, agriculture holds the first place in the national industry. In 1870, 407,735,041 acres were occupied as farms, of which the cultivated land was 188,921,099 acres. According to the agricultural returns for 1871, the acreage of the principal crops was as follows: Hay, 10,009,052; maize or Indian corn, 34,091,137; wheat, 19,943,893; oats, 8,365,800; potatoes, 1,200,912; buckwheat, 413,015; barley, 1,177,666; tobacco, 356,762; rye, 1,069,531. The other crops were sugar, rice, peas, and beans, hemp, flax, etc. The average size of farms, nearly all held by their cultivators in fee-simple, is 153 acres. The quantities of the chief agricultural productions of 1871 were: Indian corn, 991,898,000 bushels; wheat, 230,732,400 bushels; oats, 255,743,000 bushels; potatoes, 120,461,700 bushels; barley, 26,718,500 bushels; rye, 15,355,500 bushels; buckwheat, 8,328,700 bushels; hay, 22,239,400 tons; tobacco, 263,196,100 lbs.; cotton, 3,100,000 bales. In 1869-70, 2,159,516 acres of the public land were sold for cash, mostly at the ordinary price of one dollar and a quarter an acre; 515,360 acres were bought with military warrants, and 3,698,910 acres were entered under the law of congress, which gives a homestead after five years' occupation, while upward of one million and a half were granted to agricultural schools, railways, Indian reservations, or individual states. Vast quantities of land have been impoverished, exhausted, and abandoned; but improved systems of agriculture are promoted by the government, and widely introduced. Wheat and maize are grown in all the states; cotton, s. of lat. 37°; cane-sugar, in Louisiana, Texas, and Florida; hemp and tobacco, chiefly between lat. 34° and 40°; rice, in South Carolina and Georgia; figs and oranges flourish in the gulf states; and peaches, grapes, melons, and other delicious fruits are abundant and in great perfection s. of lat. 43°. At the census of the United States, taken in 1870, there were in the country 8,690,219 horses, 28,974,582 cattle, 28,477,951 sheep, and 25,184,540 hogs.

Manufactures, Commerce, etc.—Manufactures, protected by high duties on foreign importations, have had a rapid development, as will be seen in the accounts of individual states. The census of 1870 gives the following aggregates for the year: Pig-iron, used chiefly in the manufacture of stoves and hollow-ware, 2,052,821 tons; rolled iron, 1,975,000 tons; manufactures of cotton, 956, making goods to the value of \$177,489,739; 2,891 woolen mills, using 172,000,000 lbs. wool, and 17,571,929 lbs. cotton in mixed fabrics, and producing goods to the value of \$155,405,358; leather in boots and shoes, value \$146,704,055, curried and tanned, \$130,000,000; flour, \$444,985,143; lumber, \$210,159,327; with large quantities of petroleum, spirits, india-rubber goods, steam engines, and machinery, paper, oil-cloth, carriages, sewing machines, and agricultural implements. The chief manufacturing states are Maine, New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, and Maryland. The whole number of manufacturing establishments, large and small, in the United States in 1870, was 252,148, employing a capital of \$2,118,208,769; using raw material of the value of \$2,488,427,242; and employing the labor of 1,615,598 males and 323,770 females, besides 114,628 children, and producing manufactures valued at \$4,232,325,442.

The commerce of the United States, foreign and internal, is in proportion to its agriculture and industry. The exports of the year ending June 30, 1876, amounted to \$636,620,593, or £127,324,118, of which the chief articles were wheat, flour, cotton, tobacco, pork, and hams, butter, cheese, lumber, fish, manufactured goods, oils, gold, and silver, etc. The imports were \$476,576,871, or £95,315,274, the principal articles being foreign manufactures, sugar, tea, coffee, wool, iron, and steel, etc. The total number of vessels that entered in the foreign trade in 1874-75 was 27,961, with a tonnage of 11,692,810; cleared, 28,238 vessels, of 11,896,507 tons.—Great facilities for internal commerce are given by free trade between all states and territories, and the great extent of navigable rivers, canals, and railways. The Mississippi and its branches afford 20,000 m. of steamboat navigation; and most of the rivers emptying into the Atlantic, gulf of Mexico, and Pacific, are navigable from 100 to 500 m.; canals unite the waters of the Hudson river with lakes Champlain, Ontario, and Erie in New York, the Delaware and Susquehanna rivers in Pennsylvania, the Ohio with lake Erie in Ohio and

Indiana, and the Mississippi with lake Michigan in Illinois. Other canals make with these an extent of 3,500 m., costing \$100,000,000. Railways extend from the lakes to the gulf of Mexico, and from the Atlantic to the Pacific, of which there were in operation in Jan., 1876, 74,658 miles. The number of telegraph offices was 6,852; the total length of lines, 79,000 m.; and of wires, 172,000 miles.

Education and Religion.—The benevolent, literary, and scientific institutions of the United States are generally state institutions, accounts of which will be found under the heads of the respective states. The exceptions are the Smithsonian institute (q.v.), American association for the advancement of science, the national academy of sciences, and military and naval academies and hospitals.—In the United States are 360 colleges, 93 theological schools, 20 schools of law, 71 of medicine, 26 scientific, great numbers of academies or high schools, and female seminaries. Free common schools are established in nearly all the states, sufficient for universal education, supported by taxes, school funds, and in all the new states, the reservation of one or two sections of land, of 648 acres each, in every township. In 1874, there were 73 public libraries containing 25,000 volumes or more, 9 of which had upward of 100,000 volumes, and a great many lyceums, literary societies, and courses of popular lectures. The press is very active. In 1871, there were 6,056 periodical publications—637 daily, 247 semi-weekly or tri-weekly, 4,642 weekly, 829 monthly and semi-monthly, and 62 quarterly, having an aggregate annual circulation of 1,436,551,538.

Religion is free from any interference of either the federal or state governments, and all denominations exist in entire freedom upon the voluntary principle. There were, according to the census of 1870, 63,082 churches or places of worship in the United States, giving 562 seats to each 1000 of population. The Roman Catholics possess 3,806 edifices, with 1,990,514 sittings. Of the twenty or more denominations of Protestants, the most numerous are the Methodists, possessing 21,337 edifices, with 6,528,209 sittings; after whom come Baptists, having 13,962 edifices, 4,360,135 sittings; Presbyterians, 7,071 edifices, 2,698,244 sittings; Congregationalists, 2,715 edifices, 1,117,212 sittings; Episcopalians, 2,601 edifices, 991,051 sittings; Christian Connection, 2,822 edifices, 865,602 sittings; Lutherans, 2,776 edifices, 977,333 sittings; Reformed churches, 1,613 edifices, 658,928 sittings; United Brethren in Christ, 937 edifices, 265,025 sittings, etc. The Jews have 152 edifices, with 73,265 sittings.

Constitution, Government, etc.—The government of the United States is one of limited and specific powers; strictly defined by a written constitution, framed by a convention of the states in 1787, which went into operation after being ratified by the thirteen original states in 1789, by which instrument the several states, having their independent republican governments, conferred upon a federal congress, executive, or president, and judiciary, such powers as were necessary to "form a more perfect union, establish justice, insure domestic tranquillity, provide for the common defense, and secure the blessings of liberty." The legislative powers granted to the federal government are vested in a congress of the United States, consisting of a senate of two senators from each state, chosen by the legislature thereof; and a house of representatives, consisting of one or more members from each state, elected by all male citizens over 21 years of age; so that the states, large and small, have each 2 votes in the senate, and from 1 to 33 (in 1832, New York had 40 members) in the house of representatives, which consists of 292 members, or 1 to 132,509 of population. The senator must be 30 years old, and is chosen for 6 years; the representative, 25 years old and elected for two years. Senators and representatives, according to an act of congress passed in 1874, are paid \$5,000 per annum, with traveling expenses. The senate is presided over by the vice-president; and is a high court for trial in cases of impeachment. It also confirms the appointments of the president, and ratifies treaties made with foreign powers. Revenue bills originate in the house of representatives. Bills passed by both houses, within the limits of their constitutional powers, become laws on receiving the sanction of the president; or, if returned with his veto, may be passed over it by two-thirds of both houses.

By the constitution, the states granted to congress power "to lay and collect taxes, duties, imports, and excises, to pay the debts, and provide for the common defense and general welfare of the United States;" to borrow money; to regulate commerce; to establish uniform naturalization and bankruptcy laws; to coin money, and fix the standards of weights and measures, and punish counterfeiting; to establish post-offices and post-roads; to secure patents and copyrights; punish piracies; declare war; raise armies and navy; to call out the militia, reserving to the states to appoint their officers; and to govern the district of Columbia, and all places purchased for forts, arsenals, etc., with the consent of the state legislatures. All powers not expressly granted are reserved to the states or the people; but the states, though sovereign and independent under the constitution, with all powers of local legislation, eminent domain (i.e., absolute possession of the soil), and power of life and death, with which neither president nor congress can interfere, cannot make treaties, coin money, levy duties on imports, or exercise the powers granted to congress.

The executive of the federal government is a president, chosen by an electoral college, equal in number to the senators and representatives, elected by the people of the states. He must be a native of the United States, 35 years old, and is elected for a term of four

years, and may be re-elected without limit. His salary is \$50,000 a year. The vice-president, who, in case of the death of the president, succeeds him, is president of the senate. If he should die after becoming president, his successor would be chosen by congress. The president, by and with the consent of the senate, appoints a cabinet, consisting of the secretaries of state and foreign affairs, treasury, war, navy, interior, the postmaster-general, and attorney-general. These officers have salaries of \$10,000 a year, have no seats in congress, and are solely responsible to the president, who also appoints directly, or through his subordinates, the officers of the army and navy—of which he is commander-in-chief—the justices of the federal judiciary, revenue-officers, postmasters, etc.—in all about 100,000 persons.

The judiciary consists of a supreme court, with one chief-justice and seven assistant justices, appointed by the president for life, and district judges in each district. The supreme court has jurisdiction in all cases arising under the constitution, laws, and treaties of the United States; causes affecting ambassadors and consuls, of admiralty and jurisdiction; controversies to which the United States is a party, or between a state and the citizens of another state, citizens of different states, citizens and foreign states. It has original jurisdiction in state cases, or those affecting ambassadors or consuls—in others, appellate. A person may be tried for treason, both against the federal government, and against the state of which he is a citizen. The president can relieve or pardon a person condemned by a federal court; but has no power to interfere with the judgments of state tribunals. Besides the supreme court, there are United States district courts, with judges, district attorneys, and marshals, in districts comprising part or whole of the several states. The citizens of each state are entitled to all privileges and immunities of the several states. Criminals escaping from one state to another are given up for trial on demand of the executive; and the constitution declared, before the rebellion, that "no person held to service or labor in one state, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due." The constitution may be amended by a convention called at the request of two-thirds of the states; or amendments may be proposed by a vote of two-thirds of congress, and ratified by three-fourths of the states; but "no state, without its consent, shall be deprived of its equal suffrage in the senate."

The president, either directly, or through the secretary of state and foreign affairs, appoints ministers, consuls, and consular agents to foreign countries. There are 12 envoys-extraordinary and ministers-plenipotentiary, receiving from \$17,500 to \$10,000 salary; 4 commissioners, at \$7,500; 19 ministers resident, \$7,500 to \$4,000. The consuls are paid by fees or salaries from \$500 to \$7,500.

The secretary of the treasury has charge of the treasury, finances, and revenue of the country, with its custom-houses and revenue-cutter service.

Revenue, Expenditure, etc.—The following table gives the expenditures (excepting interest on debt), and the debt of the United States, for 20 different years:

YEAR.	Civil list.	Military.	Naval.	Total expenses.	Debt.
1847.....	\$6,715,854	\$41,281,606	7,981,633	\$55,929,093	\$45,659,659
1848.....	5,585,070	27,820,163	9,406,737	42,811,970	65,804,450
1849.....	14,017,640	17,290,636	9,869,818	57,681,667	64,704,693
1850.....	14,829,725	12,801,764	7,923,313	43,003,168	64,228,288
1851.....	17,872,967	11,811,793	8,987,798	48,005,879	62,560,375
1852.....	17,379,768	13,424,075	8,998,236	46,007,896	67,560,395
1853.....	17,175,797	15,476,826	10,891,640	43,544,263	56,233,157
1854.....	25,907,372	14,312,684	10,768,192	51,018,248	44,075,456
1855.....	24,183,487	18,900,565	13,281,341	56,365,393	39,969,721
1856.....	25,274,351	20,821,624	14,677,017	60,772,402	39,903,910
1857.....	27,531,932	24,619,049	12,726,857	64,877,838	25,165,155
1858.....	26,387,822	31,537,307	13,976,001	71,901,130	44,910,778
1859.....	23,787,810	27,997,794	14,712,610	66,346,226	53,754,626
1860.....	31,925,557	16,400,767	11,518,150	59,844,474	61,769,703
1861.....	26,947,325	22,981,150	12,428,577	62,357,052	90,867,838
1862.....	24,511,476	394,368,707	42,674,569	461,554,752	511,826,274
1863.....	27,470,448	599,298,600	63,211,105	690,080,153	1,098,793,181
1864.....	35,093,498	690,791,842	85,733,292	811,558,632	1,740,690,489
1872.....	96,579,889	35,372,157	21,249,810	153,201,856	2,253,251,323
1875.....	108,911,574	41,120,645	21,197,626	171,529,845	2,237,813,048

The great decrease of the total expenditure in the years 1872 and 1875, compared with 1864, is accounted for by the decrease in naval and military expenses upon the cessation of the war in 1865.

The revenue of the United States up to the war of secession, 1861, was drawn almost wholly from the sale of public lands and duties on imports. In 1850, the revenue from customs was \$29,668,686; from lands, etc., \$3,707,112—total, \$43,375,798. In 1860, the revenue from customs was \$53,187,511; lands, etc., \$2,877,691—total, \$56,064,606. The cost of the war compelled the government to add to these resources a system of internal revenue or direct taxation, consisting of stamps, licenses, excise, income-tax, etc., by which the revenues were increased in 1865 to \$309,510,932. The revenue for the year

1875-76 amounted to \$438,798,281, including a large balance from the preceding year; the principal items being customs, \$148,071,985, and internal revenue, \$116,700,732. The expenditure was \$316,990,549, including \$100,243,271 of interest on the debt; \$57,034,199 for army and navy; \$17,232,240 for civil service; and \$48,315,782 for public works. The total debt in 1876 was upward of \$2,180,000,000.

The currency of the United States has been a mixed one of gold, silver, and copper, and bank-notes. Specie was for many years the only money recognized by the federal government; paper money being issued by chartered banks. The exigencies of the war of 1861-65 compelled the government to issue paper-money, and to establish national banks, in 1871, for its circulation. The paper circulation of the United States, June 30, 1870, was—United States notes and fractional currency, \$398,430,562; issue of national banks, \$299,729,834. The capital of state banks was \$67,000,000, and of private banks upward of \$300,000,000. Specie payments were resumed by the government in 1879.

The specie currency of the United States consists of the gold dollar (value in exchange about 4s. sterling); the half-eagle, \$5; the eagle, \$10; the double eagle, \$20; silver dollar, half-dollar, quarter, dime, 10 cents; half-dime; nickel cent, or 100th part of a dollar. The coinage of 1870 was—gold, \$30,103,354; silver, \$2,670,054; copper, \$611,445; from the establishment of the mint to June 30, 1870, \$1,126,419,579.

Army and Navy.—The army of the United States, under the command of the president, consisted, in 1790, of 1260 men. In 1861, its numbers were 14,000, and those who took part with the confederates, or were disbanded in the confederate states, reduced the number to about 5,000. April 15, 1861, 75,000 volunteers were called out; May 4, 64,000; July and Dec., 1861, 500,000; July 1, 1862, 300,000; Aug. 4, 1862, 300,000; summer of 1863, 300,000; Feb. 1, 1864, 500,000. The total number called out from 1861 till the end of the war in 1865, was 2,670,874. This vast army was procured by volunteering, by enlistment in the regular army, and by drafts or conscriptions; but the greater part by bounties of 300 to 1000 dollars to each volunteer. Large numbers of recruits were also found among newly arrived immigrants; and the negro troops recruited in the seceded or slave states, in Oct., 1863, numbered 38,707, and increased in numbers to the end of the war. In 1871, the regular army was reduced to the legal standard of 30,000 enlisted men, and it was subsequently enacted that from 1875 there should be no more than 25,000 men enlisted at any one time. The militia of the United States organized under the state governments, numbers 3,245,193. There are numerous arsenals and manufactories of arms at Springfield (q.v.) Massachusetts; Pittsburgh (q.v.), Pennsylvania, etc. The military academy at West Point educates cadets, nominated from each state by members of congress, and appointed by the president, who receive commissions as officers in the army.

The navy of the United States in 1876 consisted of 27 iron-clads, 72 other steamers, and 26 sailing-vessels. The iron-clad turret-steamers (see TURRET-SHIP) called monitors, constitute a powerful portion of the American navy. A naval academy has been established at Annapolis, Maryland, for the education of naval cadets.

The post-office department, organized before the revolution of 1775 by Benjamin Franklin, had in the year ending June 30, 1876, 36,515 offices. There passed through the post 778,000,000 letters, etc.

The secretary of the interior has charge of the survey and sale of the public lands of the United States, the patent office, Indian office, pension office, public buildings, national hospital for the insane, public printing, and education.

History.—The territories now occupied by the U. S. of America, though they were probably visited on their north-eastern coast by Norse navigators about the year 1000, continued the sole possession of numerous tribes of Indians (who had succeeded earlier and extinct races), until the discovery of America by Columbus, 1492. In 1498 an English expedition, under the command of Sebastian Cabot, explored the eastern coast of America from Labrador to Virginia, perhaps to Florida. In 1513 Juan Ponce de Leon landed near St. Augustine in Florida, and explored a portion of that region in a romantic search for the fountain of youth. In 1520 some Spanish vessels from St. Domingo were driven upon the coast of Carolina. In 1521, by the conquests of Cortes and his followers, Mexico, including Texas, New Mexico, and California, became a province of Spain. In 1539-42, Ferdinand de Soto led a Spanish expedition from the coast of Florida across Alabama, and discovered the Mississippi river. In 1584-85, sir Walter Raleigh sent two expeditions to the coast of North Carolina, and attempted to form settlements on Roanoke island. A Spanish settlement was made at St. Augustine, Florida, 1565. Jamestown, Virginia, was settled in 1607; New York, then called the New Netherlands, 1613; Plymouth, Massachusetts, 1620. A large part of the country on the great lakes and on the Mississippi was explored by La Salle in 1682; and settlements were made by the French at Kaskaskia and Arkansas Post, 1685; Mobile and Vincennes, 1702. The early history of the various colonies which now constitute the U. S. will be found under the heads of the different states and territories. The first effort at a union of colonies was in 1643, when the settlements in Massachusetts, New Hampshire, Rhode Island, and Connecticut formed a confederacy for mutual defense against the French, Dutch, and Indians, under the title of "The United Colonies of New England." They experienced the benefits of united action in 1754, when an English grant of lands to the Ohio com-

pany brought on the French and Indian war—the French claiming, at that period, as the first explorers, northern New England, half of New York, and the entire Mississippi valley. George Washington was sent on his first expedition, to remonstrate with the French authorities; and the colonies being advised to unite for general defense, a plan for a general government of all the English colonies was drawn up by Benjamin Franklin; but it was rejected by both the colonies and the crown—by the colonies, who wished to preserve their separate independence, and by the crown from a jealousy of their united strength. The colonists, however, took an active part in the war. Under maj. Washington, they joined gen. Braddock in his unfortunate expedition against fort du Quesne, now Pittsburg; they aided in the reduction of Louisburg, Ticonderoga, Crown Point, and Niagara; and rejoiced in the conquest of Quebec, by which the vast northern regions of America became the possessions of Great Britain.

The principles of a democratic or representative government were brought to America by the earliest colonists. The colonies themselves were founded by private adventure, with very little aid from government. The Plymouth colony was for eighteen years a strict democracy, and afterward a republic under a charter from the crown. A representative and popular government was established in Virginia in 1620. It was not until the protectorate and the reign of Charles II. that the colonies were considered as portions of the empire, to be governed by parliament, when navigation acts were passed to give English ships a monopoly of commerce, when the produce of the colonies was required to be sent to England, and duties were levied on commodities sent from one colony to another. Protests were made against these assumptions; Virginia asserted her right of self-government; and it was not until the English revolution of 1688 that settled and uniform relations with the different colonies were established.

In 1713, by the treaty of Utrecht, England, which, since the reign of Elizabeth, had imported slaves from Africa into her American and West Indian colonies, obtained a monopoly of the slave-trade, engaging to furnish Spanish America, in 33 years, with 144,000 negroes. A great slave-trading company was formed in England, one quarter of the stock being taken by queen Anne, and one-quarter by the king of Spain, these two sovereigns becoming the greatest slave-dealers in Christendom. By this monopoly, slavery was extended in, and to some extent forced upon, all the American colonies.

At this period, there was a general feeling of loyalty toward the mother country. The sons of the more wealthy colonists, especially in the south, were educated in England; English literature pervaded the colonies; the British throne was the fountain of honor; the colonies, though distinct, and differing in origin and character—Puritan in the east, Dutch Reformed in New York, Quaker in Pennsylvania, Catholic in Maryland, and church of England in Virginia—were yet united by language, common ties, fears, and interests. In 1761 the enforcement of the navigation act against illegal traders, by general search-warrants, caused a strong excitement against the government, especially in Boston. The admiralty enforced the law; many vessels were seized; and the colonial trade with the West Indies was annihilated. In 1765 the passing of an act of parliament for collecting a colonial revenue by stamps caused general indignation, and led to riots. Patrick Henry, in the Virginia assembly, denied the right of parliament to tax America, and eloquently asserted the dogma, "no taxation without representation." The first impulse was to unite against a common danger; and the first colonial congress of 28 delegates, representing 9 colonies, made a statement of grievances and a declaration of rights. The stamps were destroyed or reshipped to England, and popular societies were formed in the chief towns, called "Sons of Liberty." In 1766 the stamp act was repealed, to the general joy of the colonists; but the principle of colonial taxation was not abandoned; and in 1767 duties were levied on glass, paper, printers' colors, and tea. This renewed attempt produced, in 1768, riots in Boston, and governor Gage was furnished with a military force of 700 to preserve order and enforce the laws. In 1773 the duties were repealed, excepting 3d. a pound on tea. It was now a question of principle, and from north to south it was determined that this tax should not be paid. Some cargoes were stored in damp warehouses and spoiled; some sent back; in Boston, a mob, disguised as Indians, threw it into the harbor. To punish this outrage, parliament passed the Boston port bill, 1774, by which the chief town of New England was no longer a port of entry, and its trade transferred to Salem. The people were reduced to great distress, but received the sympathy of all the colonies, and liberal contributions of wheat from Virginia, and rice from Charleston, South Carolina.

It was now determined to enforce the government of the crown and parliament over the colonies; and a fleet, containing several ships of the line, and 10,000 troops, was sent to America; while the colonists, still asserting their loyalty, and with little or no thought of separation from the mother country, prepared to resist what they considered the unconstitutional assumptions of the government. Volunteers were drilling in every direction, and depots of provisions and military stores were being gathered. A small force being sent from Boston to seize one of these depots at Concord, Mass., led to what is called the battle of Lexington, and the beginning of the war of the revolution, April 19, 1775. The British troops were attacked on their return by the provincials, and compelled to a hasty retreat. The news of this event summoned 20,000 men to the vicinity of Boston. The royal forts and arsenals of the colonies were taken possession of, with their arms and munitions. Crown point and Ticonderoga, the principal northern forti-

fications, were surprised, and their artillery and stores appropriated. A congress of the colonies assembled at Philadelphia, which resolved to raise and equip an army of 20,000 men, and appointed George Washington commander-in-chief. June 17, Bunker hill, in Charleston, near Boston, where 1500 Americans had hastily intrenched themselves, was taken by assault by the British troops, but with so heavy a loss (1054) that the defeat had for the provincials the moral effect of a victory. After a winter of great privations the British were compelled to evacuate Boston, carrying away in their fleet to Halifax 1500 loyal families.

The British government now put forth a strong effort to reduce the colonies to submission. An army of 55,000, including 17,000 German mercenaries ("Hessians"), was sent, under the command of sir William Howe, to put down this "wicked rebellion." The provincial congress, declaring that the royal authority had ceased, recommended to the several colonies to adopt "such governments as might best conduce to the safety and happiness of the people;" and the thirteen colonies soon adopted constitutions as independent and sovereign states. On June 7, 1776, Richard Henry Lee, of Virginia, offered a resolution in congress, declaring that "the united colonies are, and ought to be, free and independent states; that they are absolved from all allegiance to the British crown; and that all political connection between them and the state of Great Britain is, and ought to be, totally dissolved." This resolution, after an earnest debate, was adopted by the votes of 9 out of 13 colonies. A committee, consisting of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston, was instructed to prepare a declaration in accordance with the above resolution; and the celebrated declaration of independence, written by Mr. Jefferson, based upon the equality of men and the universal right of self-government, and asserting that "all government derives its just powers from the consent of the governed," on July 4, 1776, received the assent of the delegates of the colonies, which thus dissolved their allegiance to the British crown, and declared themselves free and independent states, under the general title of the 13 United States of America—New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia—occupying a narrow line of the Atlantic coast between Canada and Florida, e. of the Alleghanies, with a population of about 2,500,000.

After the evacuation of Boston, gen. Washington, with the remains of his army, thinned by the hardships of winter, hastened to New York. On July 2, gen. Howe, being joined by his brother, admiral lord Howe, and sir Henry Clinton, found himself at the head of 35,000 men; defeated the Americans on Long Island, Aug. 27, 1776, compelled the evacuation of New York, and secured the possession of its spacious harbor, and the river Hudson. Gen. Washington, with inferior and undisciplined forces, retreated across New Jersey, closely followed by the English, hoping to save Philadelphia. Newark, New Brunswick, Princeton, the chief towns in New Jersey, were taken, and the British awaited the freezing of the Delaware to occupy Philadelphia. On Christmas night, gen. Washington, by crossing in boats among floating ice, made a successful night-attack upon a Hessian force at Trenton, and gave new courage to the desponding Americans, who recruited the army, and harassed the enemy with a winter campaign.

In the meantime Silas Deane and Benjamin Franklin had been sent to France to solicit recognition and aid. The recognition was delayed, but important aid was privately given in money and supplies, and European volunteers—the marquis de Lafayette, baron Steuben, baron de Kalb, Kosciusko, and Pulaski—rendering the most important services. Efforts were made to induce the British colonies of Canada and Nova Scotia to unite in the struggle for independence, and an expedition was sent against Montreal and Quebec, led by gens. Montgomery and Arnold. The Canadians refused their aid; Montgomery was killed, Arnold wounded, and the remains of the expedition returned after terrible sufferings. In 1777, after several severe actions in New Jersey, generally disastrous to the Americans, the British took possession of Philadelphia; and Washington, with the remnants of his army, went into winter-quarters at Valley Forge, where they suffered from cold, hunger, and nakedness.

While Washington was unsuccessfully contending against disciplined and overwhelming forces in New Jersey, gen. Burgoyne was leading an army of 7,000 British and German troops, with a large force of Canadians and Indians, from Canada into northern New York, to form a junction with the British on the Hudson, and separate New England from the rest of the rebel confederacy. His march was delayed by felled trees and destroyed roads; his foraging expeditions were defeated; and, after two sharp actions at Stillwater and Saratoga, with but three days' rations left, he was compelled to capitulate. Oct. 17; and England, in the midst of victories, heard with dismay of the loss of an entire army. The Americans gained 5,000 muskets, and a large train of artillery. Feeling the need of more unity of action, articles of confederation, proposed by Franklin in 1775, were adopted in 1777, which constituted a league of friendship between the states, but not a government which had any powers of coercion.

In 1778, lord Carlisle was sent to America by the British government with offers of conciliation; it was too late. France, at the same time, recognized American independence, and sent a large fleet and supplies of clothing, arms, and munitions of war to their

aid; and gen. Clinton, who had superseded gen. Howe, finding his supplies at Philadelphia threatened, returned to New York, defeating the Americans at Monmouth.

The repeated victories of the British armies, the aid afforded by great numbers of Americans who still adhered to the royal cause, and furnished during the war not less than 20,000 troops, and the alliance of large tribes of Indians, who committed cruel ravages in the frontier settlements, did little toward subjugating the country. Portions of the sea-coast of New England and Virginia were laid waste; but the king's troops were worn out with long marches and tedious campaigns, and even weakened by victories. Spain, and then Holland, joined in the war against England, and aided the Americans. Paul Jones, with ships fitted out in French harbors, fought desperate battles under the American flag on the English coast. But the king and parliament were determined to maintain the honor of the crown and the integrity of the empire. In 1780, 85,000 seamen were raised, and 35,000 additional troops sent to America, and a strong effort was made to subjugate the Carolinas, where the war became of a bitter partisan character, and was conducted with spirit by Sumpter, Marion, and other southern chieftains. Lord Cornwallis, with a large army, marched from Charleston, through North Carolina, pursuing, and sometimes defeating, the American gen. Gates. Worn out with his success, he arrived in Virginia, where he was confronted by gen. Lafayette. In the mean time, admiral de Varney had arrived upon the coast with a powerful French fleet, and 6,000 soldiers of the *élite* of the French army, under count de Rochambeau. Cornwallis was obliged to fortify himself at Yorktown, blockaded by the fleet of count de Grasse, and besieged by the allied army of French and Americans, waiting for sir Henry Clinton to send him relief from New York. Oct. 19, 1781, he was compelled to surrender his army of 7,000 men—an event which produced such a change of feeling in England as to cause the resignation of the ministry, and the dispatch of gen. sir Guy Carleton to New York with offers of terms of peace. The preliminaries were signed at Paris, Nov. 20, 1782; and on Sept. 3, 1783, peace was concluded between England and France, Holland, and America. The independence of each of the several states was acknowledged, with a liberal settlement of territorial boundaries. In April, a cessation of hostilities had been proclaimed, and the American army disbanded; New York, which had been held by the English through the whole war, was evacuated Nov. 25; on Dec. 4, gen. Washington took leave of his companions in arms, and, Dec. 23, resigned into the hands of congress his commission as commander.

From the retreat of Lexington, April 19, 1775, to the surrender of Yorktown, Oct. 19, 1781, in 24 engagements, including the surrender of two armies, the British losses in the field were not less than 25,000 men, while those of the Americans were about 8,000.

The states were free, but exhausted, with a foreign debt of \$8,000,000, a domestic debt of \$30,000,000, an army unpaid and discontented, a paper currency utterly worthless, and a bankrupt treasury. The states were called upon to pay their share of the necessary expenditures, but they were also in debt, and there was no power to compel them to pay, or to raise money by taxation. In these difficulties, and the failure of the articles of confederation, a convention was summoned by congress in 1787 to revise these articles. The task was so difficult that the convention resolved to propose an entirely new constitution, granting fuller powers to a federal congress and executive, and one which should act upon the people individually as well as upon the states. The constitution was therefore framed, whose provisions have already been stated, and which is still the basis of the government; and though strongly opposed by many, who believed that the extensive powers granted by it to congress and the executive would be dangerous to the liberties of the people, it was, in 1787-88, adopted, in some cases by small majorities, in 11 state conventions, and finally by the whole 13 states, chiefly through the exertions and writings of James Madison, John Jay, and Alexander Hamilton. Virginia ratified the constitution with the declaration that she was at liberty to withdraw from the union whenever its powers were used for oppression; and New York, after Hamilton had declared that no state could ever be coerced by an armed force. The country was at this period divided into two parties: the federalists, who were in favor of a strong centralized government, and the anti-federalists, who held to the sovereignty and rights of the independent states. George Washington and John Adams, standing at the head of the federalist party, were elected president and vice-president of the United States. The president took the oath to support the constitution in front of the city hall in New York; and the government was organized with Thomas Jefferson, secretary of state; Alexander Hamilton, secretary of the treasury; gen. Knox, secretary of war; and John Jay, chief justice of the supreme court. Congress assumed the war debts of the several states, and chartered the bank of the United States, though its constitutional right to do so was strenuously denied by the republican or states' rights party. Washington was re-elected to the presidency in 1792; but party spirit increased, excited by the events of the French revolution. Citizen Genet, who represented the French republic in America, fitted out privateers against England, and his recall was demanded by the president. The federalists took the side of England in the great European contest, while the republicans sympathized with the revolution. There grew up also difficulties between the English and American governments. The Americans accused the English of carrying off large numbers of negroes and other property at the close of the war, while the English accused the Americans of sequestrating the property of loyalists, which they

had engaged by treaty to restore to them. These controversies were happily settled by Mr. Jay.

In 1796 Washington, worn and irritated by partisan conflicts and criticisms, refused a third election, and issued his farewell address to the people of the United States, warning them against the dangers of party-spirit and disunion, and giving them advice worthy of one who was said to be "first in war, first in peace, and first in the hearts of his countrymen." John Adams was elected president and Thomas Jefferson, the second choice of the people for the presidency, became, according to the rule at first adopted, vice-president. In 1798 the commercial regulations of France, and the assertion of the right to search and capture American vessels, nearly led to a war between the two republics. In 1799 the nation, without distinction of party, mourned the death of Washington; and, in the following year, the seat of government was removed to the city he had planned for a capital, and which bears his name. The partiality of Mr. Adams for England, the establishment of a federal army, and the passing of the alien and sedition laws, by which foreigners could be summarily banished, and abuse of the government, by speech or the press, punished, caused great political excitement, and such an increase of the republican, or, as it was afterward called, the democratic party, that the president failed of a re-election in 1801; and there being no election by the people, the house of representatives, after thirty-five ballottings, chose Thomas Jefferson, the republican candidate, with Aaron Burr for vice-president; and the offices of the country were transferred to the victorious party. Internal duties, which a few years before had led to an insurrection in Pennsylvania, called the whisky insurrection, were abolished, and the alien and sedition laws repealed. Tennessee, Kentucky, Vermont, and Ohio had now been organized as states, and admitted into the union. In 1803 the area of the country was more than doubled by the purchase of Louisiana—the whole region between the Mississippi and Rocky mountains—from France for \$15,000,000. The infant navy waged a successful war with Tripoli. In 1805 Mr. Jefferson was elected for a second term; but Mr. Burr, having lost the confidence of his party, engaged in a conspiracy to seize upon the Mississippi valley, and found a new empire, with its capital at New Orleans. He was tried for treason, but not convicted. The commerce of America was highly prosperous, her ships enjoying much of the carrying-trade of Europe; but in May, 1806, England declared a blockade from Brest to the Elbe, and Bonaparte, in November, decreed the blockade of the coasts of the United Kingdom. American vessels were captured by both parties, and were searched by British ships for British subjects; and those suspected of having been born on British soil, were, in accordance with the doctrine, once a subject always a subject, impressed into naval service. Even American men-of-war were not excepted from this process. The British frigate *Leopard* meeting the American frigate *Chesapeake*, demanded four of her men, and on refusal fired into her, and the surprised *Chesapeake* struck her flag. British ships were hereupon forbidden U. S. harbors.

Mr. Jefferson, following the example of Washington, declined a third election; and, in 1809, James Madison became president. The French decrees, prejudicial to neutral commerce, were revoked in 1810; but the English continued, a source of loss and irritation, while hundreds of American citizens were in forced service in British vessels. The feeling was increased by a night-encounter between the American frigate *President* and the British sloop-of-war *Little Belt*, May 16, 1811. In April, 1812, an embargo was again declared by congress, preparatory to a declaration of war against Great Britain. July 19, for which congress voted to raise 25,000 enlisted soldiers, 50,000 volunteers, and 100,000 militia. Gen. Hull, with 2,000 men at Detroit, invaded Canada; but on being met by a small force of British and Indians, under gen. Brock, recrossed the river and made a shameful surrender; and was sentenced to death for his cowardice, but pardoned by the president. A second invasion of Canada was made near Niagara Falls by gen. Van Rensselaer. One thousand American militia stormed the heights of Queens-town, and the British gen., Brock, was killed; but re-enforcements arriving opportunely, the heights were retaken, and nearly all the Americans were killed or driven into the Niagara, while the American gen. was in vain imploring a large body of militia on the opposite bank to cross over to the support of their brethren in arms. They refused, upon the ground that the government had no constitutional right to send the militia across the frontier. The federal party, opposed to the war, defended this doctrine, and gen. Van Rensselaer resigned in disgust. American disasters on the land were, however, compensated by victories at sea. Aug. 19 the U. S. frigate *Constitution* captured the British frigate *Guerrière*; Oct. 18 the *Wasp* took the *Frolic*; Oct. 25 the frigate *United States* captured the *Macedonian*; Dec. 29 the *Constitution* took the *Jara*. The Americans in most cases had the larger ships and heavier ordnance; but the immense disparity in losses showed also superior seamanship and gunnery. American privateers took 300 British vessels and 3,000 prisoners. In 1813 gen. Proctor crossed the Detroit river with a considerable force of British and Indians, and defeated gen. Winchester, with the usual results of savage warfare. In April an American army of 1700 men captured York (now Toronto), and about the same time another American force of 800 men was defeated with great loss by the Indians under Tecumseh; but the remainder of this campaign was wholly favorable to the Americans. The attempt of the British gen., Prevost, on Sackett's Harbor was repulsed; the squadron on lake Erie, consisting of 6

vessels, 63 guns, was captured by commodore Perry at the head of an American flotilla of 9 vessels, 54 guns; and this latter success enabled gen. Harrison to invade Canada, where he defeated gen. Proctor in the battle of the Thames, in which the great Indian warrior-chief Tecumseh was killed. In 1813 another invasion of Canada was attempted; and York (now Toronto) was taken by gen. Dearborn; and an unsuccessful attempt was made to take Montreal. Villages were burned on both sides. The British also destroyed American shipping in Delaware bay. At the same period gen. Jackson defeated the Creek Indians in Alabama and Georgia, who had been excited to make war upon the frontier settlements.

In 1814 gens. Scott and Ripley crossed the Niagara, and sharp actions, with no decisive results, were fought at Chippewa and Lundy's lane, close by the great cataract. Gen. Wilkinson also invaded Canada on the Sorell river, but was easily repulsed. A British invasion, by lake Champlain, by gen. sir George Prevost, with 14,000 men and a flotilla on the lake, was no more successful. On Sept. 6, the flotilla was defeated and captured in the harbor of Plattsburg, while the army was repulsed on shore, and retreated with heavy loss. In August, a British fleet ascended Chesapeake bay, took Washington with but slight resistance, and burned the government buildings. A subsequent attack on Baltimore was unsuccessful. New York, New London, and Boston were blockaded, and a large expedition was sent against Mobile and New Orleans. On Jan. 8, 1815, gen. Packenham, advanced with 12,000 men against the latter city, which was defended by gen. Jackson, at the head of 6,000 militia, chiefly from Tennessee and Kentucky, aided by a small force of artillery, recruited from the Barataria pirates. The Americans were sheltered by a breast-work, and the British assault was met with so deadly a fire of riflemen, that it was repulsed, with the loss of gen. Packenham and several officers, with 700 killed and 1000 wounded; while the entire American loss is stated to have only amounted to 71. This ill-planned and unfortunate action was fought more than a month after peace had been concluded between England and America, and was followed by two naval actions in February and March. Though during this contest fortune at first favored the Americans on the high seas, she changed sides completely from June, 1813, as if to counterbalance the disasters of the British on land. June 1, the *Chesapeake* was taken by the *Shannon*; June 3, the *Grouler* and *Eagle* were captured by British gun-boats; the *Argus* was taken by the *Pelican*, Aug. 14; the *Essex* by the *Phaëbe* and *Cherub*, Mar. 29, 1814; the *President* by the *Endymion*, Jan. 15, 1815; the only counter-balancing success being the sinking of the British sloop *Acorn* by the *Wasp*, Sept. 8, 1814. In Dec., 1814, the federalists of New England held a convention at Hartford in opposition to the war and the administration, and threatened a secession of the New England states. See HARTFORD CONVENTION. In 1815 commodore Decatur, who had taken a distinguished part in the recent war, commanded an expedition against the Algerians—whose corsairs had preyed on American commerce in the Mediterranean—and dictated terms to Algiers, Tunis, and Tripoli.

The democratic republican party having brought the war to a satisfactory conclusion, the federalists disappeared; and in 1817 James Monroe was elected to the presidency, almost without opposition, in what was termed "the era of good feeling." A rapid emigration from Europe and from the Atlantic states to the richer lands of the west had in ten years added six new states to the union. Difficulties arose with the warlike southern Indian tribes, whose hunting-grounds were invaded; and gen. Jackson, sent against the Seminoles, summoned to his aid the Tennessee volunteers who had served under him against the Creeks and at New Orleans, defeated them, pursued them into Florida, took Pensacola, and banished the Spanish authorities and troops. He was, however, supported in these high-handed measures by the president; and in 1819 Florida was ceded by Spain to the United States. In 1820 Alabama and Maine, a slave and a free state, were added to the union; and the question of the admission of Missouri arose in congress—the question of its admission with or without slavery. At the period of the revolution, slavery existed in all the states except Massachusetts; but it had gradually been abolished in the northern and middle states, except Delaware, and excluded from the new states between the Ohio and Mississippi by the terms on which the territory had been surrendered by Virginia to the union. Under the constitution, slaves were not counted in full as a represented population; but by a compromise, three-fifths of their numbers were added to the whites. The slave states were almost exclusively agricultural, with free-trade interests. The free states were encouraging manufactures by protection. The two sections had already entered upon a struggle to maintain the balance of power against each other. After an excited contest, Missouri was admitted, with a compromise resolution, that in future no slave state should be erected n. of the parallel of 36° 30' n. lat.—the northern boundary of Arkansas. During the second term of Mr. Monroe, in 1824, gen. Lafayette visited America, and was everywhere received with great enthusiasm. In the presidential election of 1824 there were four candidates—John Quincy Adams, Andrew Jackson, Henry Clay, and William H. Crawford. There being no choice by the people, the house of representatives chose Mr. Adams; John C. Calhoun being elected vice-president. Party and sectional feeling became stronger. Mr. Adams and Mr. Clay, who had heretofore acted with the party of Jefferson and Madison, were henceforth identified with what was called the national republican, and later, the whig, and finally, in union with the anti-slavery party, the repub-

lican party. In 1826 two of the founders of the republic, John Adams and Thomas Jefferson, died on July 4, the anniversary of the declaration of independence—an event which made a profound impression. The four years of Mr. Adams, during which there were violent contests on protection and the powers of the federal government to carry out public works within the states, ended with an excited election contest, which resulted in the triumph of the democratic party and the election of Andrew Jackson, with John C. Calhoun as vice-president. The bold, decisive, and impetuous character of gen. Jackson was shown in a general removal of those who held office, down to small postmasters and tidewaiters, under the late administration, and the appointment of his own partisans. An act for the rechartering of the United States bank was met by a veto of the president, who declared it unconstitutional and dangerous. In 1832 an Indian war, called the Black Hawk war, broke out in Wisconsin; but the passing of a high protective tariff act by congress caused a more serious trouble. The state of South Carolina declared the act unconstitutional, and therefore null and void, threatening to withdraw from the union if an attempt were made to collect the duties on foreign importations. The president prepared to execute the laws by force; Mr. Calhoun resigned his office of vice-president, and asserted the doctrine of state rights, including the right of secession, in the senate. A collision seemed imminent, when the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties, until 1843, when they should not exceed 20 per cent *ad valorem*.

The popularity of gen. Jackson caused his re-election by an overwhelming majority against Henry Clay, the leader of the bank, protection, and internal improvement party; and he entered upon his second term with Martin Van Buren of New York as vice-president. The removal of the government deposits from the U. S. bank to certain state banks, led to the failure of the bank, and after some years, to the adoption of Mr. Van Buren's plan of an independent treasury. The Cherokee Indians in Georgia who had attained to a certain degree of civilization, appealed to the president for protection against the seizure of their lands by the state; but they were told that he "had no power to oppose the exercise of the sovereignty of any state over all who may be within its limits;" and the Indians were obliged to remove to the territory set apart for them, w. of the Mississippi. In 1835 the Seminole war broke out in Florida; and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola (q.v.), kept up hostilities for years, at a cost to the United States of several thousands of men and some \$50,000,000. In 1837 Martin Van Buren succeeded gen. Jackson in the presidency. His term of four years was a stormy one, from the great financial crisis of 1837, which followed a period of currency-expansion and wild speculation. All the banks suspended payment, and the great commercial cities threatened insurrection. Mr. Van Buren was firm in adhering to his principle of collecting the revenues of the government in specie, and separating the government from all connection with the banks. His firmness in acting against the strong sympathies of the northern and western states with the Canadian insurrection of 1837-38, also damaged his popularity; and in 1840 the election of gen. Harrison, with John Tyler for vice-president, was one of unexampled excitement, characterized by immense popular gatherings, political songs, the use of symbols, and the participation of both sexes to a degree hitherto unknown in America. The whigs triumphed in nearly every state; gen. Harrison was inaugurated Mar. 4, 1841; and the rush to Washington for offices was as great as the election had been exciting and remarkable. Worn down with the campaign and the office-seekers, gen. Harrison died in a month after his inauguration, and was succeeded by John Tyler, who, having been a democrat, was no sooner in power than he seems to have reverted to his former political principles. He vetoed a bill for the establishment of a national bank and other measures of the party by which he had been elected. His cabinet resigned, with the exception of Daniel Webster, secretary of state, and others, democratic or neutral, were appointed in their place. During Mr. Tyler's administration, the north-eastern boundary question, which nearly occasioned a war with England, was settled by Mr. Webster and lord Ashburton; a difficulty amounting almost to a rebellion was settled in Rhode Island; but the most important question agitated was that of the annexation of Texas. This annexation was advocated by the south, as a large addition to southern and slave territory; and, for the same reason, opposed by the whig and anti-slavery parties of the north. Besides, the independence of Texas, though acknowledged by the United States, England, and France, had not been acknowledged by Mexico, and its annexation would be a *casus belli* with that power. The recent admissions of Iowa and Florida into the union had kept the balance of power even between north and south, but Texas would be an advantage to the south. But the gain of territory, and a contempt for Mexico, overcame these objections, and in 1845 Texas was formally annexed to the United States; and James K. Polk of Tennessee succeeded Mr. Tyler in the presidency.

M. Almonte, the Mexican minister at Washington, protested against the annexation of Texas as an act of warlike aggression; and to guard against a threatened invasion of Texas, gen. Zachary Taylor was ordered, with the U. S. troops of his military district, to its southern frontier. The Mexicans crossed the Rio Grande, and commenced hostilities, April 26, 1845. Gen. Taylor moved promptly forward, and won the victories of Palo Alto, Resaca de la Palma, Monterey, Saltillo, and finally, against great odds—20,000 to 4,759—the hard-fought battle of Buena Vista, a victory that excited great

enthusiasm. In the meantime, gen. Wool had been sent on an expedition to Chihuahua in northern Mexico; gen. Kearny to New Mexico; and capt. Fremont and commander Stockton took possession of California. Mar. 9, 1847, gen. Scott landed at Vera Cruz, which he took on the 29th, after a siege and bombardment by land and water. Marching into the interior with a force of about 9,000 men, he found gen. Santa Anna intrenched on the heights of Cerro Gordo with 15,000 men. On April 18, every position was taken by storm, with 3,000 prisoners, 43 cannon, 5,000 stand of arms, etc. Waiting at Puebla for re-enforcements until August, gen. Scott advanced with 11,000 men toward Mexico, near which gen. Santa Anna awaited him with large forces and in strong positions. On Aug. 19 and 20 were fought the battles of Contreras and Churubusco, in which 9,000 Americans vanquished an army of over 30,000 Mexicans in strongly fortified positions. After a brief armistice, hostilities recommenced on Sept. 7; and after a series of sanguinary actions, the American army, reduced to about 8,000, entered the City of Mexico, which ended the war. By the treaty of Guadalupe, the United States obtained the cession of New Mexico and Upper California, the United States paying Mexico \$15,000,000, and assuming the payment of the claims of American citizens against Mexico. The opposition to the annexation of Texas, and to the war and the acquisition of the newly acquired territory, became now complicated and intensified by sectional feelings and the opposition to slavery. The northern party demanded that slavery should never be introduced into territories where it had not existed; the south claimed the right of her people to emigrate into the new territories, carrying with them their domestic institutions. During the debates on the acquisition of the Mexican territories, Mr. Wilmot of Pennsylvania introduced an amendment, called the "Wilmot proviso," providing that there should be neither slavery nor involuntary servitude in the acquired territory. This was voted down, but became a party principle. In 1849 gen. Taylor, the "rough and ready" victor of Buena Vista, became president, with Millard Fillmore as vice-president. The free-soil party* had nominated Martin Van Buren, with Charles Francis Adams for vice-president; the democratic candidate being gen. Lewis Cass. The liberty party in 1840 had cast 7,609 votes; in 1844 it had 62,300; Mr. Van Buren in 1848 received 291,263, so rapid was the growth of a party soon destined to control the policy of the government. Sept. 1, 1849, California, rapidly peopled by the discovery of gold, adopted a constitution which prohibited slavery. Violent struggles and debates in congress followed, with threats of secession, and protests against interference with slavery. The more zealous abolitionists of the north denounced the constitution for its support of slavery, and its requirement of the return of fugitive slaves to their owners, and threatened separation. The south denounced the violation of the constitution by interference with slavery—a domestic institution of the states—the carrying off of negroes secretly by organized societies, and what was termed the "underground railway," and the passage of personal liberty bills in several states, which defeated the fugitive slave law, and the requirements and guarantees of the constitution. Mr. Clay introduced a compromise into congress, admitting California as a free state, and introducing a new and more stringent law for the rendition of fugitive slaves. President Taylor, more used to the rough life of a frontier soldier than the cares of state, died July 9, 1850, and was succeeded by Mr. Fillmore.

The election of Franklin Pierce in 1852, against gen. Scott, was a triumph of the democratic, states' rights, and southern party. Jefferson Davis, a senator from Mississippi, a son-in-law of gen. Taylor, and who had served under him in Mexico, was appointed secretary of war. New elements were added to the sectional controversies which agitated the country by the repeal of the Missouri compromise, and the passage of the Kansas-Nebraska bill of senator Douglass, which left the people of every territory, on becoming a state, free to adopt or exclude the institution of slavery. The struggles of Kansas, approaching a civil war between the free-soil and pro-slavery parties in that rapidly growing territory, resulted in the exclusion of slavery. A brutal assault upon Mr. Sumner, senator from Massachusetts, by a southerner, named Preston Brooks, in consequence of a violent speech on southern men and institutions, increased the excitement of both sections. The formation of an anti-foreign and no-popery party, called the "know-nothing" party, acting chiefly through secret societies, was a singular but not very important episode in American politics, though it may have influenced the succeeding election.

In 1856 the republicans, composed of the northern, free-soil, and abolition parties, nominated John C. Fremont for the presidency, while the democratic and states' rights party nominated James Buchanan. Ex-president Fillmore received the know-nothing nomination. The popular vote was—for Buchanan, 1,838,169; Fremont, 1,341,264; Fillmore, 874,534. Mr. Buchanan was inaugurated Mar. 4, 1857, with John C. Breckinridge, afterward a general of the confederate army, as vice-president. A difficulty with the Mormons, which caused the president to send a military force to Utah, was settled without bloodshed. The efforts of the government to execute the fugitive slave law kept up an irritated feeling. There were savage fights between the northern and southern parties in Kansas, and on the western borders of Missouri. Resolute and well-

* The free-soil party opposed the extension of slavery by the admission of new slave states, while recognizing its legal and constitutional existence where already established.

armed settlers were sent out by New England emigration societies. In Oct., 1859, John Brown, known in Kansas as "Ossawatimie Brown," who, with his sons, had been engaged in the struggles in Kansas, planned and led an expedition for freeing the negroes in Virginia. He made his attempt at Harper's Ferry, on the Potomac, where, after a vain attempt to induce the negroes to join him, he and his small party took possession of one of the government workshops, where he was taken prisoner by a party of United States soldiers, and handed over to the authorities of Virginia, tried and executed, Dec. 2. His body was taken to his home in New York for burial, and he was regarded by the abolition party as a martyr.

In 1860 the democratic party, which, except at short intervals, had controlled the federal government from the election of Jefferson in 1800, became hopelessly divided. The southern delegates withdrew from the convention at Charleston, and two democratic candidates were nominated, Stephen A. Douglas of Illinois, and John C. Breckenridge of Kentucky; while the republicans, or united whig or abolition party, nominated Abraham Lincoln of Illinois; and the native or American party nominated John Bell of Tennessee. The republican convention adopted a moderate and even conservative "platform" of principles, denounced the John Brown raid, and put forward as a principle, "the maintenance inviolate of the rights of the states, and especially the right of each state to order and control its own domestic institutions according to its own judgment exclusively." Still, the country was sectionally divided, and all who had labored to limit and destroy the southern institution of slavery were acting with the republican party.

At the election of Nov., 1860, Mr. Lincoln received every northern vote in the electoral college, excepting the three of New Jersey, which were given to Mr. Douglas, 180 votes; while Mr. Breckenridge received the 72 electoral votes of the south. The north and south were arrayed against each other, and the south was beaten. Of the popular vote, Mr. Lincoln received 1,357,610; Mr. Douglas, 1,365,976; Mr. Breckenridge, 847,951; Mr. Bell, 590,631. Thus, while Mr. Lincoln gained an overwhelming majority of the electoral votes given by each state, the combined democratic votes exceeded his by 356,317, and the whole popular vote against him exceeded his own by 946,948. A small majority, or even plurality, in the northern states was sufficient to elect him.

The south lost no time in acting upon what her statesmen had declared would be the signal of their withdrawal from the union. On Nov. 10, as soon as the result was known, the legislature of South Carolina ordered a state convention, which assembled Dec. 17, and on the 20th unanimously declared that "the union now subsisting between South Carolina and other states, under the name of the United States, is hereby dissolved;" giving as a reason that 14 of these states had for years refused to fulfill their constitutional obligations. The example of South Carolina was followed by Mississippi, Jan. 8, 1861; Florida, 10th; Alabama, 11th; Georgia, 19th; which were followed by Louisiana and Texas; and in 1861, by North Carolina, Virginia, Tennessee, and Arkansas. Kentucky and Missouri were divided, and had representatives in the governments and armies of both sections.

On Feb. 4, 1861, delegates from the seven then seceded states met at Montgomery, Ala., and formed a provisional government, under the title of the Confederate States of America. A constitution was adopted similar to that of the United States, and the government fully organized, Feb. 18, 1861; president, Jefferson Davis of Mississippi; vice-president, Alexander H. Stephens of Georgia; and May 24, established at Richmond, Virginia. The secession movement appears to have been nearly unanimous in the more southern states, and to have been carried in all by decided majorities. As state after state withdrew from the union, its senators and representatives in congress at Washington resigned their seats; and nearly all the officers of the army and navy, of southern birth, believing that their first and final allegiance was due to their states, and that the action of each state carried with it all its citizens, also resigned their commissions, and tended their swords to their respective states, and to the confederacy they had formed.

President Buchanan, doubting his constitutional power to compel the seceding states to return to the union, made a feeble and ineffectual attempt to relieve the garrison of fort Sumter, in Charleston harbor, closely besieged by the forces of South Carolina. Commissioners were sent to Washington to negotiate for the settlement of the claims of the federal government, and great efforts were made to effect compromises of the difficulties, but without result.

On the 4th of Mar., 1861, president Lincoln was inaugurated at Washington. In his address, he said: "I have no purpose, directly or indirectly, to interfere with the institution of slavery in the states where it exists. I believe that I have no lawful right to do so, and I have no inclination to do so." On the 7th of April, a naval expedition set sail from New York for the relief of fort Sumter; and its arrival off Charleston harbor was the signal for the commencement of a bombardment of the fort by the confederate batteries of gen. Beauregard. The surrender of the fort, April 11, was followed by a sudden outburst of excited feeling in the north. The government called out 75,000 volunteers, large numbers of whom were in a few days marching to the defense of Washington. April 18, the confederates seized the U. S. arsenal at Harper's ferry, and took or destroyed a large quantity of arms and machinery. On the 20th, the navy-yard, near Norfolk, Va., was destroyed by the U. S. officers, and five large men-of-war burned or

sunk, to prevent their falling into the hands of the confederates. Opposed to the federal volunteers assembled at Washington, the confederates took up a position at Bull Run, a few miles distant from the Potomac, under gen. Beauregard, where they were attacked by gen. McDowell. A severe action resulted in the repulse and complete panic of the federals, who hastily retreated to Washington. Congress saw that it must act in earnest, and that the rebellion was not to be put down in 90 days by 75,000 volunteers. It voted to call out 500,000 men. The confederates states had a pop. of 5,582,122 free inhabitants, and 3,519,902 slaves; total, 9,102,024; and though the negroes were not called into the field except as laborers, they were not less useful in supplying the armies, by carrying on the agricultural labor of the country. The confederates had also the strong sympathy and aid of the four slaveholding border states, prevented by their position from seceding—Delaware, Maryland, Kentucky, and Missouri.

Holding their position in Virginia, the confederates erected fortifications on the Tennessee and Cumberland rivers, and on important points of the Mississippi, from Columbus, in Kentucky, to its mouth. They also made a strong effort to secure the state of Missouri, as well as to defend the sea-ports through which they must receive their most important supplies from abroad. The federal government, on its side, blockaded the whole line of coast from Virginia to Texas, and sent large forces to secure the doubtful states. Gun-boats were rapidly built for the rivers of the west, and vessels purchased and constructed for the navy. In Dec., 1861, the federals had 640,000 men in the field; and the confederates had 210,000, and had called for 400,000 volunteers.

The first important operation of 1862 was the taking the defenses of the Cumberland and Tennessee rivers (Feb. 6), which led to the occupation of Nashville, the capital of Tennessee, henceforth held by the federals—Andrew Johnson, formerly governor and senator, having been appointed military governor. Roanoke island was also captured, on the coast of North Carolina. In March, gen. McClellan, who had succeeded the aged lieutenant-gen. Scott as commander-in-chief, commenced a movement on Richmond, the seat of the confederate government, now defended by gen. Lee. On the 8th of Mar., the confederate iron-clad *Virginia*, constructed from the U. S. steamer *Merrimac*, which had been sunk at Norfolk, and raised by the confederates, attacked the federal fleet in Hampton roads, and in 40 minutes sunk the *Cumberland*, and set on fire and captured the *Congress* (frigates); while the other vessels took refuge in shoal water or in flight. The next day, the *Monitor*, a war-vessel of entirely novel construction, low and flat, with a revolving turret, invented by capt. Ericsson, engaged the *Virginia*. The battle lasted two hours without result. On the 6th of April, a sanguinary but indecisive battle was fought near Corinth, Ala., the federals being protected by gun-boats. Soon after, admiral Farragut, with a fleet of 45 vessels, carried the forts at the mouth of the Mississippi river, and took New Orleans; while the armies and gun-boats captured the fortifications on the upper part of the river as low as Memphis, Tenn. In the mean time, gen. McClellan had besieged and taken Yorktown, and fought his way up the peninsula of the James river, until within five m. of Richmond, when he was beaten in a series of sanguinary battles, and driven, with a loss, in six days, of 15,000 men, to the shelter of his gun-boats; while gens. Banks and Pope, sent to co-operate with him in the Shenandoah valley, were defeated and driven back by gen. "Stonewall" Jackson. On the 1st of July, the president called for 300,000, and Aug. 4,300,000 more men for the federal army. Congress abolished slavery in the district of Columbia, prohibited it in the territories, and passed a resolution to compensate the masters in any state that would abolish slavery. They also authorized the president to employ negroes in the army, and to confiscate the slaves of rebels. In August, the federals were a second time defeated at Bull Run, and gen. Lee crossed the Potomac into Maryland, creating great alarm in Washington, and even in Philadelphia. Gen. McClellan made a rapid march, and met him at Sharpsburg or Antietam. A drawn battle resulted in the retreat of gen. Lee, covering an immense train of provisions, horses, cattle, etc., which was probably the object of his expedition. A confederate invasion of Kentucky, about the same time was attended with similar results. Another advance on Richmond was led by gen. Burnside, who had superseded gen. McClellan; but he was confronted by gen. Lee at Fredericksburg, and defeated in one of the most sanguinary battles of the war. President Lincoln issued a proclamation declaring the freedom of all the slaves in the rebel states, which it was expected might cause them to rise against their masters; but it was without result. While the army of the Potomac was vainly endeavoring to advance on Richmond, the army of Tennessee, under gen. Rosencranz, with its base at Nashville, was trying to sever the Atlantic from the gulf states, and cut off the railways that supplied the confederate armies in Virginia. At Murfreesborough, Tenn., the confederate gen. Bragg attacked gen. Rosencranz with the usual result of heavy losses on both sides, but no decided victory.

Early in May 1863, gen. Hooker, who had succeeded gen. Burnside in the command of the army of the Potomac, crossed the Rappahannock, and was defeated by gen. Lee at Chancellorsville with great slaughter; but this victory was dearly bought by the loss of gen. Jackson, mortally wounded in mistake by his own soldiers. Gen. Lee now took the offensive, and invaded Pennsylvania, advancing as far as Harrisburg; but being met by gen. Meade, the new commander of the army of the Potomac, he attacked him in a strong position at Gettysburg without success, and was compelled to recross

the Potomac. In the mean time, the two principal fortresses of the Mississippi, Vicksburg and Port Hudson, attacked by land and water, after a long siege, were starved into capitulation, and the entire river was open to federal gun-boats. Charleston, blockaded since the beginning of the war, was now strongly besieged—its outworks, forts Gregg and Wagner, taken, fort Sumter battered in pieces, but still held as an earthwork, and shells thrown a distance of 5 m. into the inhabited part of the city. In September, gen. Rosencranz had taken the strong position of Chattanooga, and penetrated into the n.w. corner of Georgia, where he was disastrously defeated by gen. Bragg at the battle of Chickamanga. At this period, there were great peace-meetings in the north, terrible riots in New York against the conscription and the negroes; while the banks having suspended specie payments, the paper-money of both federals and confederates was largely depreciated. The confederates were, however, cut off from all foreign aid, except what came to them through the blockade, and their own resources, both of men and material, were becoming exhausted. The railways were worn, many destroyed or occupied by the federals, and it became difficult to transport supplies and feed armies. The federals had command of the sea, and access to all the markets of Europe.

At the commencement of 1864, the federals held, including the garrisons on the Mississippi, nearly 100,000 prisoners of war. The southerners also had about 40,000 federal prisoners, whom they could feed with difficulty, and who suffered great hardships. Gen. Ulysses S. Grant, who had been successful at Vicksburg, was appointed commander-in-chief of the federal armies, and commenced a vigorous campaign over an immense area—in Virginia, the Carolinas, Georgia, Louisiana, and Arkansas, with the determination "to hammer continuously against the armed forces of the enemy and his resources, until by mere attrition he should be forced to submit." Of the confederates, gen. Lee defended Petersburg and Richmond; gen. J. E. Johnston opposed the army of Tennessee at Dalton, Georgia; gen. Forrest was in Mississippi; gen. Taylor and Kirby Smith commanded in Louisiana and Arkansas. In February, gen. Sherman marched from Vicksburg, making a destructive raid across northern Mississippi to Alabama. In March, the federals had 1,000,000 of men raised and provided for. The entire confederate forces probably numbered 250,000. The army of the Potomac, commanded by gen. Meade, under the personal superintendence of gen. Grant, covered Washington, and advanced toward Richmond. gen. Butler advanced from fortress Monroe up the James river; gen. Sigel marched up the Shenandoah. Sherman united the armies of Tennessee, Cumberland, and Ohio, at Chattanooga, where he had nearly 100,000 men and 250 guns. Gen. Banks had 61,000 men in Louisiana. In March gen. Banks moved up the Red river, toward Shreveport, but was defeated on the 24th, and driven back to New Orleans. In May, the campaign of Virginia commenced, and the army of the Potomac fought a series of battles at the Wilderness, Spotsylvania court-house, Jericho's ford, North Anna, and Cold harbor, with terrible losses. After each repulse the federals took up a new position further s., with a new base, until they had made half the circuit of the confederate capital. Gen. Breckenridge defeated Sigel in the Shenandoah valley, and once more threatened Washington. Gen. Sheridan, with a strong cavalry force, drove back the confederates, and laid waste the valley. In September, gen. Sherman advancing with a superior force, captured Atlanta. Gen. Hood, superseding Johnston in the command of the confederates, was out-generated and beaten. While he marched w. to cut off gen. Sherman's base, and attack Nashville, where he was defeated, Sherman burned Atlanta, destroyed the railway, and marched boldly through Georgia to Savannah. The confederates made strong efforts, and won victories, but with no permanent result.

In 1865, the federals made a new draft for 500,000 men. Expeditions were organized against Mobile. Wilmington, the most important confederate port, was taken by a naval and military expedition. Savannah and Charleston, approached in the rear by Sherman, were evacuated. Cavalry raids cut off the railways and canal that supplied the confederate army in Petersburg and Richmond. Finally, on Mar. 29, '65, a series of assaults was made upon the confederate works, during ten days of almost continual fighting, until the confederates were worn down with fatigue. Richmond and Petersburg were evacuated April 2; and on the 9th, after several conflicts, gen. Lee surrendered at Appomattox court-house, his army numbering 28,000. At this period, it is said that there was not lead enough remaining in the confederate states to fight a single battle. On the 12th, Mobile surrendered with 3,000 prisoners and 300 guns. Then gen. Johnston, in North Carolina, surrendered a few days after to gen. Sherman; and the trans-Mississippi confederate army followed his example.

The war was scarcely ended, when 800,000 men were paid off. During the war, the number of men called for by the federal government was 2,759,049; the number actually furnished was 2,653,062. Of colored troops there were 186,097. The state of New York, with a pop. of less than 4,000,000, sent 223,836 volunteers. There was an annual waste of one-third, half of which was by wounds in battle. The federal losses during the war were estimated at 316,000. The statistics of the confederate forces are imperfect; but in 1864, the army consisted of 20,000 artillery, 128,000 cavalry, 400,951 infantry; total, 549,226 men. The confederate losses are unknown.

Mr. Lincoln was in 1865 triumphantly re-elected to the presidency, with Andrew

Johnson as vice-president. On April 14, while the north was rejoicing over the capture of Richmond and the surrender of the confederate armies, the president was assassinated at a theater in Washington, by John Wilkes Booth, an actor; while an accomplice attacked and nearly killed Mr. Seward, secretary of state. The assassin was pursued and killed, and several of his accomplices tried and executed. Andrew Johnson became president. Jefferson Davis and the members of the confederate government were supposed to be privy to the assassination of president Lincoln, and large rewards were offered for their apprehension. Mr. Davis was captured in Georgia, and placed in fortress Monroe, but was released without trial in May 1867. An amendment to the constitution, for ever abolishing slavery in the states and territories of the union, was declared ratified by two-thirds of the states, Dec. 18, 1865. The vast change in the organization of the republic made by this new fundamental law was completed by the 14th and 15th amendments, passed in 1868 and 1870, which gave to the former slaves all the rights and privileges of citizenship. The seceded states were readmitted to the union on condition of their adhesion to the constitution as thus amended. In 1867, the United States acquired by purchase the whole of Russian America (see ALASKA). In 1872, the Alabama (q.v.) court of arbitration gave its decree in favor of the United States, while the San Juan boundary dispute with Great Britain was settled on the same side by the emperor of Germany. The outrages of a secret organization known as the Ku-Klux-Klan, in the southern states, necessitated the passing of an act in 1861, giving cognizance of such offenses to the U. S. courts. In 1875, great excitement was created in the states by the discovery of grave malversations on the part of citizens holding high rank in the public service.

The year 1876, memorable in the annals of the republic as the hundredth anniversary of the declaration of independence, was celebrated by a great centennial exhibition at Philadelphia. The presidential election of the same year was of more than usual interest. Gen. Ulysses S. Grant (q.v.) chosen president in 1869, had been re-elected in 1873. When the result of the keenly contested election toward the close of 1876 was made known, it seemed as if fortune had favored the democratic party. But many of the returns from the various states were disputed; and for several months the intensest excitement prevailed. At last, a special tribunal, selected from the senate, the house of representatives, and the judges of the supreme court, was appointed to examine the election returns. The result was that Mr. Hayes, the republican candidate, was declared to have been elected president, and inaugurated Mar. 4, 1877.

UNITED STATES OF AMERICA (*ante*). The tenth decennial census gives the population of the United States as 50,152,866; divided as to sex into 25,520,582 males, and 24,632,284 females, the proportion being 96,519 females to 100,000 males; whereas the proportion in 1870 was 97,801 to 100,000. The center of population was found to be, in 1880, at a point 8 m. w. by s. of Cincinnati, having moved 58 m. westward since the last preceding census. The exact geographical location of this point was in lat. 39° 04' 08"; long. 84° 39' 40". For events in the history of the United States preceding the close of the war of the rebellion, see **UNITED STATES**, *ante*; and **REBELLION**, **WAR OF THE**. After the war the important duty of reconstructing the governments of the states recently in rebellion became the most important question before the national government. Here a difference grew up between pres. Johnson and congress, the president having proclaimed a policy in the settlement of the southern question, which was obnoxious to the republican leaders in both houses of congress. The president, having recognized loyal governments as existing in the states of Virginia, Tennessee, Arkansas, and Louisiana, appointed provisional governors for the other lately seceded states, with the power to call conventions for the purpose of establishing permanent governments. His policy was to recognize governments so organized; and to restore the states in question to their rights under the constitution, whenever they should have repealed their several ordinances of secession, repudiated the confederate debt, and ratified the thirteenth amendment to the constitution, adopted in 1865, forever putting an end to slavery in the United States. This plan was unsatisfactory to congress, which passed in 1867 three acts, known as "the reconstruction acts," under which the southern states were divided into military districts, and placed under the military authority of the United States: while it became necessary for the states recently in rebellion, in order to regain their status among the other states, to ratify both the thirteenth and fourteenth amendments to the constitution; the latter of which gave the right of suffrage to the negro: denied to those persons previously in rebellion against the United States the right to hold office under the national or state governments; and repudiated the confederate debt. The bitter struggle between the president and congress continued during the remainder of his administration, and culminated in the resolution of the house of representatives, passed Feb. 24, 1868, to impeach the president "of high crimes and misdemeanors." The immediate occasion of the passage of this resolution was the course of pres. Johnson in violating the "tenure-of-office act," as it was termed, which made requisite the consent of the senate to removals from office by the president, and which was particularly intended to interfere with and prevent his removal of Mr. Stanton from the position of secretary of war. The senate formed itself into a high court of impeachment; and, Mar. 23, 1868, the chief-justice presiding, proceeded to try Andrew Johnson

on eleven articles of impeachment. The result was his acquittal, and the retirement of Mr. Stanton from the office of secretary of war. It was not until 1868 that the states of Arkansas, Alabama, Florida, North and South Carolina, Georgia, and Louisiana were readmitted into the union.

The nominations for president and vice-president in 1868 were Ulysses S. Grant of Illinois, and Schuyler Colfax of Indiana, on the part of the republicans; and Horatio Seymour of New York, and Francis P. Blair, jr., of Missouri, on the part of the democrats. The republican candidates were elected, and gen. Grant was inaugurated March 4, 1869. Feb. 25 of this year, a joint resolution of congress proposed the 15th amendment to the constitution, which finally established and defined the right of suffrage in its application to persons of color. This amendment was ratified by Virginia in 1869; and by Mississippi and Texas in 1870; and these states were readmitted to the union. One of the most important events of pres. Grant's administration was the meeting of the joint high commission, appointed to consider the *Alabama* case, and which concluded the "treaty of Washington, so called, ratified by the U. S. senate, May 24, 1871. The commission met in Washington city, and the treaty provided that a tribunal of arbitration should be constituted, to consist of one member from Great Britain, one from the United States, and one each from Switzerland, Italy, and Brazil. The function of this tribunal was to decide on the *Alabama* claims, being the claims of the United States against the British government for damages on account of the damage done to American commerce by the *Alabama* and other confederate cruisers, fitted out in British ports. The *Alabama* commission met at Geneva, in Switzerland, Dec. 15, 1871, and after a presentation of the cases of the two governments adjourned to meet again June 15, 1872. At the latter date, accordingly, the sessions were renewed, and at the 32d of these, Sept. 14, the decision was announced, that "the tribunal, by a majority of four voices to one, awards to the United States a sum of \$15,500,000 in gold, as the indemnity to be paid by Great Britain to the United States for the satisfaction of all the claims referred to the consideration of the tribunal;" the dissenting voice was that of the representative of Great Britain. Among other notable occurrences during this administration were the completion of the Union and Central Pacific railroads, 1869; providing a continuous line of railway from the Missouri to the Pacific, and completing the trans-continental system. Out of the connection of the government with the construction of these roads, arose the Credit Mobilier scandal, which involved the reputation of a number of prominent members of congress. The outrages of the white population of the southern states upon the freedmen, particularly in regard to the exercise by the latter of their newly-acquired right of suffrage, attracted public attention, 1868-72, until the investigation by congress, and consequent legislation, had made such outrages difficult. See *KU KLUX KLAN*. The movement by the U. S. government in the direction of the acquisition of Saint Domingo was another incident of pres. Grant's first administration which may be regarded as important. See *SAINT DOMINGO*. The presidential election of 1872 developed a tendency toward the formation of new party lines, out of which grew the so-called "liberal-republican" party, which met in convention in Cincinnati and nominated Horace Greeley for president; a nomination which was ratified by the democratic convention—except a section of "bolters" who nominated Charles O'Connor of New York, on a purely democratic platform. The republicans met in convention at Philadelphia, and nominated Ulysses S. Grant for a second term; with Henry Wilson of Massachusetts for vice-president. The latter ticket received the electoral vote of 29 states, 286 votes, and was declared elected. A melancholy result of this campaign was the death of Horace Greeley, which was occasioned by the excitement of a severe party struggle, combined with the bitter disappointment occasioned by his defeat. In 1872 began, on the n.w. frontier, the Indian fight known as the Modoc war, and continued into 1873. See *MOPOCS*. Trouble with Spain was near occurring in this latter year, through the act of the Spanish steamer *Tornado*, in capturing the *Virginus*, on Oct. 31, a vessel sailing on the high seas, under the American flag. The *Virginus* was engaged in transporting men and arms for the insurgents in Cuba, and had 170 men on board, including the crew; these were all taken prisoners, and 58 of them, including capt. Fry, commanding the *Virginus*, and gen. Ryan, an American, were summarily shot. The affair created great excitement throughout the United States, and was only peaceably settled after much negotiation, and while actual preparations for war were being made on both sides. The remainder of gen. Grant's administration was marked by no special event, excepting the celebration of the centennial of American independence, May 10, 1876, in Philadelphia, by an international exposition of arts, manufactures, and products. See *CENTENNIAL EXHIBITION*.

The election scenes and events of 1876 have passed into history as among the most exciting and important in the annals of the country. An election so close as to hang upon a single electoral vote; charges of fraudulent voting in several states to a sufficient extent to render questionable not one alone, but several votes in the electoral college; party feeling running so high as to threaten at each moment the performance of some overt act on one side or the other, which might deluge the country with blood, and set back civilization for many years; such were the elements which render this struggle the most momentous since the foundation of the government. For details concerning this election, see *HAYES*, *RUTHERFORD B.*, and *TILDEN*, *SAMUEL J.* The former was finally

declared elected by an electoral commission chosen from both houses of congress and from the supreme court of the United States; and whose decision was accepted by all concerned as final and irrevocable. See **ELECTORAL COMMISSION**. Pres. Hayes appointed for his cabinet—and they were confirmed March 10, 1877—William M. Evarts, secretary of state; John Sherman, secretary of the treasury; Carl Schurz, secretary of the interior; R. W. Thompson, secretary of war; George W. McCrary, secretary of the navy; D. M. Key, postmaster-general; and Charles Devens, attorney-general. Changes were afterward made in the cabinet, so that only Messrs. Evarts, Sherman, Schurz, and Devens remained in it until the close of Mr. Hayes's administration. The year 1887 was made memorable by the troubles in South Carolina and Louisiana; where rival state governments, each claiming to be legally elected, struggled for supremacy. In the former state the difficulty was adroitly settled by pres. Hayes, who invited the two claimants to the governorship of that state—Chamberlain and Wade Hampton—to appear before him and endeavor to effect an adjustment of the questions at issue. The result of this novel action was the withdrawal of the U. S. troops which had been stationed at Columbia, S. C., and had been an objectionable feature of the contest; whereupon the republican governor, Chamberlain, retired, and gen. Wade Hampton took peaceful possession of the office. A settlement was also effected in Louisiana, a commission being sent thither by the president, when the democratic governor, Nichols, was enabled to gain possession of his seat, the U. S. troops being in this instance also withdrawn from New Orleans. This year was further noteworthy by the occurrence in July of the railroad strikes and riots, which prevailed throughout the country, to the injury of business, and with serious loss of property. See **STRIKES**. The question of the title of president Hayes to his seat attracted some attention during 1878, and resolutions and a memorial were laid before the legislature of the state of Maryland asking for legislative investigation on the part of congress as to its legality. A committee of investigation as to the frauds alleged to have been committed in Florida, Louisiana, South Carolina, and Oregon, in connection with the election of president, was afterward appointed by congress, and did so investigate: neither of these movements served to disturb Mr. Hayes's title. The excitement occasioned by the near approach of the period fixed by congress for the resumption of specie payments produced a demand on the part of numbers of persons throughout the country for a party opposed to the prevailing sentiment with regard to financial questions. Such a party was, in fact, organized at Toledo, Ohio, Feb. 22, 1878, under the name of the national party, delegates being present from 28 states; and its platform of principles duly enunciated. This included bi-metalism; the government to exercise exclusively the function of creating money and regulating its value; suppression of national bank issues; money to be provided by the government in accordance with the necessities of labor and trade; bonds to be taxed; a graduated income-tax to be levied; reduction of the hours of labor, bureaus of labor and industrial statistics to be established; opposition to the contract-system in prisons, and to Chinese labor. This party originated in the movement in 1876 which resulted in the nomination of Peter Cooper as the "greenback" candidate for president. The vote cast by the party in Nov., 1876, was 82,640; in 1877, 187,095; in 1878, 1,000,365.—The crops in 1878 were unusually large, the figures being as follows:

PRODUCT.	Quantity.	Acres.	Value.
Wheat, bush.....	420,122,400	32,108,560	\$326,346,424
Rye, ".....	25,842,790	1,622,700	13,592,826
Oats, ".....	413,578,560	13,176,500	101,945,830
Barley, ".....	42,245,630	1,790,400	24,483,315
Buckwheat, ".....	12,246,820	673,100	6,454,120
Potatoes, ".....	124,126,650	1,776,800	73,059,125
Tobacco, lbs.....	392,546,000	542,850	22,137,428
Hay, tons.....	39,608,296	26,931,300	285,543,752
Cotton, lbs.....	2,347,471,250	12,266,800	2,500,000
Corn, bush.....	1,388,218,750	51,585,000	441,153,405

During the year 1878 an important event in foreign relations was the establishment of a permanent Chinese legation at Washington, including the following personages: Chen Lan Pin, envoy extraordinary and minister plenipotentiary; Yung Wing, assistant envoy; Yung Tsang Siang, Chinese secretary of legation; D. W. Bartlett, American secretary of legation; Hwang Tah Kuen and Tsai Sih Yung, interpreters; and Kai Sung, *attaché*. This embassy was the result of the treaty with China, ratified at Washington on July 16, 1878, and which had been negotiated by Mr. Burlingame, U. S. minister at Peking. Special articles of this treaty were those permitting entire religious liberty in the two countries; reprobating any but voluntary emigration from one to the other; conferring mutual privileges, immunities, and exemptions, in respect to travel and residence, on citizens of the two treaty-making powers; and insuring all the advantages of the government educational institutions of the two countries to the citizens of either; including also permission for the citizens of either country to establish and maintain schools, respectively, in each country, in accordance with the laws of each for such cases made and provided. The new treaty was received in the United States with general satisfaction, and the arrival of this, the first permanent embassy, was hailed

with gratification as foreshadowing more intimate commercial, social, and diplomatic relations between the two nations. The general course of the administration of pres. Hayes had thus far been uneventful. The country was in a fairly prosperous condition, chiefly owing to the continuance of abundant crops; and the year 1878 closed without any significant occurrence whatsoever to mar the equable flow of affairs, domestic and foreign. Jan. 2, 1879, specie payments were resumed throughout the United States, after a suspension of 17 years, and in accordance with the act of congress approved Jan. 14, 1875. The process of resumption was effected without excitement, there being but little demand for gold; and the New York gold room closed operations. The crops for 1879 exceeded in quality and value those of 1878, as will be observed by the following table:

PRODUCT.		Quantity.	Acres.	Value.
Corn,	bush.....	1,547,901,790	53,085,450	\$580,486,217
Wheat,	".....	448,756,630	32,545,950	497,030,142
Oats,	".....	23,639,460	1,625,450	15,507,491
Rye,	".....	303,761,330	12,683,500	120,533,294
Barley,	".....	40,283,100	1,680,700	23,714,444
Buckwheat,	".....	13,140,000	629,900	7,855,191
Potatoes	".....	181,626,400	1,836,800	79,153,673
Tobacco, lbs.	.....	391,278,350	492,100	23,727,524
Hay, tons.	.....	35,493,000	27,484,991	339,044,494
Cotton, lbs.	.....	2,367,540,900	12,595,500	242,140,987

An extraordinary movement northward of the colored population of certain of the southern states took place in 1879, and was the source of much uneasiness among the planters, and the subject of general discussion throughout the country: for detailed account of this remarkable spontaneous race-migration, see *NEGRO EXODUS*. This year, also, saw the decline and fall of the labor agitation in San Francisco, which, under the leadership of Denis Kearney, had been continued with great virulence since 1877. So powerful did this movement become, that it was able to dictate a new constitution for the state of California, an act which resulted in driving capital from the state, and in bringing about a condition of business depression and general stagnation, never before paralleled on the Pacific coast. The conclusion of this agitation was the deposition of Kearney from leadership, as to which, and for other details, see *KEARNEY, DENIS*. The year 1880 opened with a serious political trouble in Maine, where two legislatures (fusion and republican) declared themselves to be legally in session; two governors of the state were declared elected, and were inaugurated; and a serious situation ensued, threatening bloodshed and revolution for many weeks; concluded by the supreme court of the state declaring in favor of the republican governor, Daniel F. Davis, who took possession of the office on Jan. 17.

This being the year of the presidential election, conventions were held in every state, by the different political parties; and on June 2 the republican national convention met in Chicago to nominate candidates for president and vice-president. The names most prominent before this convention were those of Ulysses S. Grant, James G. Blaine, and John Sherman, for president. The excitement within the convention and throughout the country was intense. The opposition to gen. Grant's re-election for a third term was extended throughout the republican party, though several states at their conventions had chosen delegations favoring Grant to the national convention, and directed them to vote as a unit, notably New York and Pennsylvania. The vote for gen. Grant in the convention finally settled at 306, and it became obvious that it was impossible to effect any union of the conflicting delegations on either Blaine or Sherman with sufficient strength to insure nomination. Through the efforts of William H. Robertson, a delegate from New York, the unit rule was broken by that delegation, and a compromise was effected on James A. Garfield of Ohio, with Chester A. Arthur of New York as vice-president; who were nominated June 8. On June 11 the greenback national convention met in Chicago and nominated James B. Weaver for president, who was afterward accepted as the candidate of the socialist party. On June 22 the democratic national convention assembled at Cincinnati, Ohio, the most prominent names before it being Tilden, Bayard, Thurman, and Hancock. The name of Samuel J. Tilden was withdrawn early in the convention; and on June 24 the nominations were made of maj. gen. Winfield S. Hancock for president, and William H. English of Indiana for vice-president. The political campaign was conducted with great activity, and with exceeding bitterness on both sides. The election of the fusion candidate for governor in Maine in September having alarmed the republicans, every effort was made to carry Indiana and Ohio in the October elections; and these proving successful, the democrats became in turn depressed, and made extraordinary efforts during the brief remaining period before the national election. The personal intervention of gen. Grant in the campaign in October; and the desperate efforts made in the state of New York by a thoroughly organized corps of republican speakers, proved the turning movement of the campaign, which also was influenced by the question of the tariff. The election occurred on Nov. 2, with the following result: Garfield (rep.) 4,441,233; Hancock (dem.) 4,443,325; Weaver (gr'b'k.) 314,324; prohibition, independent, and scattering, 10,487; total popular vote 9,209,369. The electoral vote stood as follows:

GARFIELD AND ARTHUR.

California.....	1	Nebraska.....	3
Colorado.....	3	New Hampshire.....	5
Connecticut.....	6	New York.....	35
Illinois.....	21	Ohio.....	22
Indiana.....	15	Oregon.....	3
Iowa.....	11	Pennsylvania.....	29
Kansas.....	5	Rhode Island.....	4
Maine.....	7	Vermont.....	5
Massachusetts.....	13	Wisconsin.....	10
Michigan.....	11		
Minnesota.....	5		214
Majority.....			59

GARFIELD AND ARTHUR.

Alabama.....	10	Nevada.....	3
Arkansas.....	6	New Jersey.....	9
California.....	5	North Carolina.....	10
Delaware.....	3	South Carolina.....	7
Florida.....	4	Tennessee.....	12
Georgia.....	11	Texas.....	8
Kentucky.....	12	Virginia.....	11
Louisiana.....	8	West Virginia.....	5
Maryland.....	8		
Mississippi.....	8		155
Missouri.....	15		

On the opening of these electoral votes in Feb., 1881, James A. Garfield and Chester A. Arthur were declared duly elected.

REVENUE AND EXPENDITURES OF THE UNITED STATES FOR EACH FISCAL YEAR.
FROM 1862 TO 1879, INCLUSIVE.

YEAR.	Receipts.	Expenditures.	Public Debt.
1862.....	\$51,987,455 43	\$474,761,818 91	\$524,176,412 13
1863.....	112,697,290 95	714,740,725 17	1,119,772,138 63
1864.....	264,620,771 60	865,322,641 97	1,815,784,370 57
1865.....	333,714,605 08	1,297,555,224 41	2,680,647,869 74
1866.....	558,032,620 06	520,500,416 99	2,773,236,173 69
1867.....	490,634,010 27	357,542,675 16	2,678,126,103 87
1868.....	405,638,083 32	377,340,284 80	2,611,687,851 19
1869.....	370,943,747 21	332,865,277 80	2,489,002,480 58
1870.....	411,255,477 63	300,653,560 75	2,366,358,589 74
1871.....	333,323,944 89	292,177,188 25	2,292,030,834 90
1872.....	374,106,867 56	277,517,962 67	2,491,486,343 62
1873.....	333,738,204 67	290,345,245 33	2,147,818,713 57
1874.....	289,478,755 47	287,133,873 17	2,143,088,241 16
1875.....	238,000,051 10	274,623,302 84	2,128,688,726 32
1876.....	287,482,039 16	253,459,797 33	2,099,439,344 99
1877.....	269,000,586 62	238,600,008 93	2,060,158,232 26
1878.....	257,763,478 70	236,964,326 80	2,035,780,831 82
1879.....	273,827,184 46	266,947,883 53	2,027,207,256 97

TABLE FROM THE CENSUS OF 1880 SHOWING THE RELATIONS OF NATIVE AND FOR
EIGN-BORN PERSONS IN THE SEVERAL STATES AND TERRITORIES, AND IN THE
UNITED STATES.

STATE.	Total Population, 1880.	PLACE OF BIRTH.	
		Native.	Foreign.
Alabama.....	1,262,794	1,253,121	9,673
Arizona.....	40,441	24,419	16,022
Arkansas.....	802,564	792,269	10,295
California.....	864,086	572,006	292,080
Colorado.....	194,649	154,869	39,780
Connecticut.....	622,683	492,879	129,804
Dakota.....	135,180	83,387	51,793
Delaware.....	146,654	137,182	9,472
District of Columbia.....	177,638	160,523	17,115
Florida.....	267,351	257,631	9,720
Georgia.....	1,539,043	1,523,733	10,315
Idaho.....	32,611	22,629	9,982
Illinois.....	3,078,769	2,495,177	583,592
Indiana.....	1,978,362	1,894,597	143,765
Iowa.....	1,624,630	1,362,132	261,488
Kansas.....	995,966	886,261	109,705
Kentucky.....	1,648,708	1,589,237	59,471
Louisiana.....	940,103	885,964	54,139
Maine.....	648,945	590,076	58,869
Maryland.....	934,632	851,984	82,648
Massachusetts.....	1,783,012	1,339,919	443,093
Michigan.....	1,636,331	1,247,985	388,346
Minnesota.....	780,806	513,107	267,699
Mississippi.....	1,131,592	1,122,424	9,168
Missouri.....	2,168,804	1,957,564	211,240
Montana.....	39,157	27,612	11,515
Nebraska.....	452,433	355,043	97,390
Nevada.....	62,265	36,623	25,642
New Hampshire.....	346,984	300,961	46,023
New Jersey.....	1,130,983	909,398	221,585
New Mexico.....	118,430	108,493	9,932
New York.....	5,082,810	3,872,372	1,211,438
North Carolina.....	1,400,047	1,396,363	3,679
Ohio.....	3,198,230	2,803,496	394,734
Oregon.....	174,767	144,327	30,440
Pennsylvania.....	4,282,786	3,695,253	587,533
Rhode Island.....	276,528	262,598	73,930
South Carolina.....	595,622	987,961	7,641
Tennessee.....	1,542,403	1,525,881	16,522
Texas.....	1,592,574	1,478,068	114,516
Utah.....	143,906	99,974	43,932
Vermont.....	332,286	291,340	40,946
Virginia.....	1,512,806	1,498,189	14,667
Washington.....	75,120	59,259	15,861
West Virginia.....	613,443	600,211	18,229
Wisconsin.....	1,315,480	910,663	405,417
Wyoming.....	20,788	14,943	5,845
Total.....	50,132,866	43,475,506	6,677,360

TABLE FROM THE CENSUS OF 1880, SHOWING THE RELATIONS OF THE SEXES IN THE SEVERAL STATES AND TERRITORIES AND IN THE UNITED STATES.

STATES.	Distribution by sex.		Number of females to 100,000 males.	
	Males.	Females.	1870.	1880.
Alabama	622,800	639,904	103,993	102,731
Arizona	28,202	12,239	40,235	43,398
Arkansas	416,383	386,181	95,146	92,747
California	518,271	346,415	60,309	66,841
Colorado	129,471	65,178	60,612	50,342
Connecticut	305,886	316,797	102,606	103,567
Dakota	82,302	52,818	59,732	64,249
Delaware	74,153	72,501	99,615	97,772
District of Columbia	83,594	94,044	111,764	118,501
Florida	135,393	131,958	98,574	97,464
Georgia	761,184	777,864	104,525	102,191
Idaho	21,818	10,793	23,104	49,468
Illinois	1,587,433	1,491,236	92,922	93,946
Indiana	1,010,676	967,686	96,880	95,746
Iowa	848,238	776,286	90,763	91,530
Kansas	536,725	459,241	80,196	85,562
Kentucky	832,676	816,032	98,447	98,001
Louisiana	468,833	471,270	100,714	100,520
Maine	324,084	324,861	100,226	100,239
Maryland	462,004	472,628	102,838	102,300
Massachusetts	858,475	924,537	107,075	107,055
Michigan	802,276	774,055	91,674	89,769
Minnesota	419,262	361,544	86,871	86,233
Mississippi	567,137	564,455	100,261	99,527
Missouri	1,127,424	1,041,380	92,034	92,308
Montana	28,180	10,977	22,801	38,953
Nebraska	249,275	203,158	74,644	81,500
Nevada	42,013	20,252	31,230	46,204
New Hampshire	170,575	176,409	104,510	103,420
New Jersey	559,823	571,160	101,562	102,025
New Mexico	63,751	54,679	94,917	85,770
New York	2,506,283	2,577,527	102,603	102,543
North Carolina	688,203	711,844	106,546	103,438
Ohio	1,614,165	1,584,074	99,264	98,135
Oregon	103,388	71,379	71,139	69,040
Pennsylvania	2,136,635	2,146,151	100,282	100,445
Rhode Island	133,023	143,495	107,485	107,864
South Carolina	490,464	505,153	102,176	102,944
Tennessee	769,374	773,089	101,897	100,479
Texas	838,719	733,855	93,293	89,882
Utah	74,470	69,436	96,700	93,240
Vermont	166,888	165,398	99,462	99,107
Virginia	745,899	766,967	105,200	102,832
Washington	45,977	29,143	59,807	63,385
West Virginia	314,479	303,961	98,552	96,656
Wisconsin	680,106	635,374	93,558	93,423
Wyoming	14,151	6,637	26,306	46,901

TABLE FROM THE CENSUS OF 1880, SHOWING THE OUTSTANDING BONDED INDEBTEDNESS OF CITIES AND TOWNS (AND IN NEW ENGLAND, TOWNSHIPS) CONTAINING A POPULATION OF 7,500 AND UPWARD.

STATE.	Total bonded debt.	Per capita.	STATE.	Total bonded debt.	Per capita.
Maine	\$11,635,550	\$100 22	Kentucky	\$10,321,500	\$51 91
New Hampshire	2,952,400	26 31	Tennessee	1,583,400	15 89
Vermont	607,900	25 85	Ohio	38,291,926	50 26
Massachusetts	73,696,019	65 68	Indiana	6,958,700	27 52
Rhode Island	11,424,750	62 93	Illinois	18,590,680	24 14
Connecticut	12,846,564	43 52	Michigan	5,109,775	18 22
New York	207,742,881	81 46	Wisconsin	3,683,650	16 16
New Jersey	38,578,350	76 69	Iowa	2,749,300	18 02
Pennsylvania	95,258,134	63 26	Minnesota	2,991,911	27 79
Maryland	34,516,417	103 91	Missouri	26,178,499	65 95
Delaware	1,372,450	32 29	Kansas	1,521,777	27 42
Virginia	10,705,177	68 64	Nebraska	428,535	9 85
West Virginia	596,500	16 20	Nevada	112,000	8 17
North Carolina	530,500	30 56	Oregon	76,500	4 35
South Carolina	4,775,451	79 54	Colorado	7,055,115	21 77
Georgia	8,387,000	83 15			
Florida	3,492,500	62 90	RECAPITULATION.		
Alabama	373,217	31 59	New England states	\$113,163,183	\$62 18
Mississippi	15,968,570	70 30	Middle Atlantic states	377,468,232	76 51
Louisiana	8,141,662	34 14	Southern states	59,944,171	65 86
Arkansas	178,694	13 55	Western states	113,731,327	32 28

TABLE FROM THE CENSUS OF 1880, OF THE SPECIFIC COTTON MANUFACTURE OF THE UNITED STATES.

STATES.	Number of looms.	Number of spindles.	Number bales of cotton used.	Persons employed, including agents, overseers, clerks, mechanics, watchmen, and operatives.
Alabama.....	1,060	55,072	14,887	1,600
Arkansas.....	28	2,015	720	64
Connecticut.....	18,036	931,538	107,877	15,497
Delaware.....	823	48,858	7,512	685
Florida.....	....	816	350	33
Georgia.....	4,713	200,974	67,874	6,678
Illinois.....	24	4,860	2,361	281
Indiana.....	776	33,396	11,558	720
Kentucky.....	73	9,022	4,215	359
Louisiana.....	120	6,096	1,354	108
Maine.....	15,978	696,685	112,361	11,318
Maryland.....	2,325	125,014	46,947	4,159
Massachusetts.....	94,788	4,465,290	578,590	62,794
Michigan.....	131	12,120	600	208
Mississippi.....	704	26,172	6,411	748
Missouri.....	341	19,312	6,399	515
New Hampshire.....	25,487	1,008,521	172,746	16,657
New Jersey.....	3,344	232,305	20,569	4,658
New York.....	12,822	578,512	70,014	10,710
North Carolina.....	1,950	102,767	27,508	3,423
Ohio.....	42	14,328	10,597	563
Pennsylvania.....	10,541	446,379	86,355	11,871
Rhode Island.....	30,274	1,649,295	161,604	22,228
South Carolina.....	1,776	92,788	33,099	2,195
Tennessee.....	1,068	46,268	11,699	1,312
Texas.....	71	2,648	246	71
Utah.....	14	432	....	29
Vermont.....	1,180	55,088	7,404	735
Virginia.....	1,324	44,336	11,461	1,112
Wisconsin.....	400	10,240	3,173	282
Total.....	230,223	10,921,147	1,586,581	181,628

SILK MANUFACTURE.

Summary of silk productions.—Finished goods for the year ending June 30, 1880.

Sewing silk.....	\$776,120
Machine twist.....	6,000,265
Floss silk.....	219,250
Dress goods.....	4,115,205
Satins.....	1,101,875
Tie silks and scarfs.....	606,675
Millinery silks.....	891,955
Other broad goods.....	627,595
Handkerchiefs.....	3,862,550
Ribbons.....	5,955,005
Laces.....	437,000
Braids and bindings.....	999,685
Fringes and dress trimmings.....	4,950,275
Cords, tassels, passementeries, and millinery trimmings.....	1,863,575
Upholstery and military trimmings.....	1,392,355
Coach laces and carriage trimmings.....	37,510
Undertakers', hatters', and fur trimmings.....	59,805
Mixed goods and silk values therein.....	510,763

Total..... \$34,410,463

NUMBER OF FACTORIES IN THE UNITED STATES, CAPITAL INVESTED, AND NUMBER OF LOOMS USED IN MANUFACTURING.

STATE.	No. of factories whose reports are included.	Capital (real and personal) invested in the business.	No. of looms.	STATE.	No. of factories whose reports are included.	Capital (real and personal) invested in the business.	No. of looms.
California.....	5	\$164,300	24	New Jersey.....	108	\$6,952,325	4,531
Connecticut.....	23	4,436,500	615	New York.....	150	4,471,775	2,101
Illinois.....	5	82,000	64	Ohio.....	6	24,700	19
Kansas.....	1	9,501	....	Pennsylvania.....	49	1,379,900	831
Maine.....	1	30,000	....	Rhode Island.....	1	7,500	....
Maryland.....	4	20,900	30	Vermont.....	1	2,000	....
Massachusetts.....	22	1,306,100	241	Total.....	383	\$18,899,500	8,467
Missouri.....	1	4,000	2				
New Hampshire.....	1	8,000	....			

NUMBER OF HANDS EMPLOYED AND TOTAL AMOUNT OF WAGES PAID DURING THE CENSUS YEAR.

STATE.	Greatest number of hands employed at any one time during the year.	Reported average number of hands employed.			
		Males above 16 years.	Females above 15 y'rs.	Children and youths.	Total amount paid in wages during the year
California.....	185	20	106	25	\$41,400
Connecticut.....	3,766	737	1,990	653	1,026,530
Illinois.....	322	39	156	51	56,330
Kansas.....	2	1	.....	1	250
Maine.....	60	9	46	5	10,100
Maryland.....	82	12	56	14	11,000
Massachusetts.....	2,068	353	1,275	188	521,730
Missouri.....	5	3	2	.....	750
New Hampshire.....	13	2	5	1	2,500
New Jersey.....	13,932	4,696	5,600	2,508	4,047,745
New York.....	10,484	2,406	5,396	1,739	2,097,025
Ohio.....	142	21	73	41	12,550
Pennsylvania.....	3,360	1,000	1,870	319	674,130
Rhode Island.....	15	1	7	.....	1,900
Vermont.....	4	.....	2	.....	125
Total.....	34,440	9,350	16,344	5,605	\$9,107,825.

UNITED STATES ARMY. During the war of the revolution the army included regular troops furnished by the several states, according to quota allotment and state militia. The official returns made to the war office show that there were under continental pay during the war the following number of men contributed by the different states:

	1775.	1776.	1777.	1778.	1779.	1780.	1781.	1782.	1783.
New Hampshire.....	2,824	3,019	2,283	1,283	1,004	1,777	700	744	733
Massachusetts.....	16,444	17,372	10,791	8,937	6,287	7,880	5,298	4,423	4,370
Rhode Island.....	1,193	1,900	518	3,056	1,263	915	164	481	372
Connecticut.....	4,507	12,127	4,563	4,010	3,544	3,687	3,921	1,732	1,740
New York.....	2,075	5,744	2,832	2,104	2,256	2,847	1,178	1,198	1,160
Pennsylvania.....	400	10,395	7,464	3,684	3,476	3,337	1,346	1,205	1,568
Virginia.....	3,180	6,181	7,013	5,220	3,973	2,886	4,119	1,204	629
North Carolina.....	2,000	1,134	1,281	387	3,930	.....	.....	1,105	697
South Carolina.....	4,000	2,069	1,650	1,650	.....	.....	.....	.....	139
Georgia.....	1,000	351	1,423	67	87	.....	.....	.....	145
New Jersey.....	.....	9,086	1,408	1,586	1,276	1,267	823	660	676
Delaware.....	.....	754	299	349	317	556	80	164	235
Maryland.....	.....	3,229	3,565	3,307	2,849	2,065	2,107	1,280	974
	37,623	63,061	44,920	.....	.....	.....	.....	.....	.....

On June 12, 1776, congress passed a resolution organizing the war office; or, as it was then termed, the board of war and ordnance, and which consisted of 5 members. In the following year this was reorganized, a board of war being provided for, to consist of three persons not members of congress. Afterward a medical inspection and pay department were added; and in 1781 the office of secretary at war was created and his powers and duties defined. Gradually the entire official direction of the war establishment was placed in the hands of this official, subject to the orders of the president, *ex-officio* commander-in-chief; this latter provision occurring after the adoption of the constitution in 1789; when also the style and title of the secretary were changed from secretary at war to secretary of war, which it has remained ever since. In 1812 the quartermaster-general's department, purchasing department, and ordnance department were organized. After the close of the war of the revolution, and when Washington had laid down his command, the continental army was soon disbanded. In 1798, when war with France was actually begun upon the sea, a new army was hastily organized to repel the anticipated invasion of the United States by a French force. Gen. Washington was placed in command, and preparations for a prolonged and doubtful struggle were carried into effect. But the army was not called into action, negotiations with Napoleon I. reconciling the differences between the two countries, and the men were presently again disbanded. The acts of the congress of the confederation concerning the organization of the army were, up to this time, as follows: The act of Sept. 29, 1789, by which "a corps of 700 rank and file (to be stationed on the frontier) to be organized, together with two companies of artillery, raised by resolve of Oct. 20, 1786;" and the act of April 30, 1790, in lieu of the preceding act, to regulate and establish one battalion of artillery, and one regiment of infantry, in all, 1216 men. In 1791 an act was passed (March 3) organizing one additional regiment of infantry; in 1792 to these were added one squadron of light dragoons and 3 regiments and 5 battalions of infantry; in 1794 an act was passed to establish arsenals and military stores; and another to organize a corps of artillerists and engineers; and to this was added in 1798 a second regiment of artillerists

and engineers. The act of May 28, 1798, in view of the prospective war with France, authorized the president to raise a provisional army of 10,000 rank and file, to be organized into corps of artillery, cavalry, and infantry, and authorized also the appointment of a lieutenant-general, "to command the armies of the United States," general Washington being so appointed; and a supplementary act (July 16, 1798), still further increased the authorization to the president by the number of 12 regiments of infantry, with the necessary commanding officers and staff, line officers, etc. The act of March 3, 1799, abolished the title and office of lieutenant-general, and directed that the commander of the army of the United States should be commissioned by the title of the "general of the armies of the United States." The opening of the war of 1812 with England brought about an increase of the army by congress, and directed that it should include 25 regiments of infantry, with the necessary officers; and 20 regiments of infantry in addition if needed, with 3 regiments of riflemen. The act of Feb. 8, 1815, organized the ordnance department; and that of March 3, 1815, fixed the peace establishment at not exceeding 10,000 men. In 1821 a still greater reduction was made; and when the Florida war broke out in 1834, the army comprised the staff, one regiment of dragoons, 4 regiments of artillery, and 7 of infantry, commanded by a major-general and two brigadiers.

TABLE SHOWING THE NUMBER OF MEN AND CASUALTIES IN THE REGULAR AND VOLUNTEER FORCES DURING THE WAR WITH MEXICO—1846 TO 1848.

STATE.	Strength.	Killed.	Died of Wounds.	Wounded.
Regular army, including marines.....	42,545	536	408	2,102
Alabama Volunteers.....	3,026	...	...	...
Arkansas ".....	1,323	19	2	32
California ".....	571	...	...	...
Florida ".....	370	...	...	...
Georgia ".....	2,132	6	...	8
Illinois ".....	6,123	86	12	160
Indiana ".....	4,585	47	...	92
Iowa ".....	253	...	...	...
Kentucky ".....	4,842	78	4	105
Louisiana ".....	7,947	13	2	8
Maryland and District of Columbia Volunteers.....	1,355	8	3	21
Massachusetts Volunteers.....	1,057	...	...	...
Michigan ".....	1,103	...	...	...
Mississippi ".....	2,423	54	4	108
Missouri ".....	7,016	20	3	46
New Jersey ".....	425	...	...	...
New York ".....	2,396	24	19	156
North Carolina ".....	935	...	...	...
Ohio ".....	5,536	18	...	39
Pennsylvania ".....	2,503	21	14	162
South Carolina ".....	1,077	30	26	216
Tennessee ".....	5,865	43	6	129
Texas ".....	8,018	42	4	29
Virginia ".....	1,320	...	...	4
Wisconsin ".....	146	...	...	...
Mormons ".....	585	...	...	...
Re-mustered ".....	844	4	1	3

During the rebellion the number of men enrolled and equipped in the northern armies was 2,690,401, including re-enlistments. They were organized into the army of the Potomac, army of the Tennessee, army of the Cumberland, and army of the Ohio; the last three being finally united into the military division of the Mississippi. These armies were raised under proclamation by the president—each state furnishing its quota, according to population; by voluntary enlistment; and by enforced draft. Regimental organizations, when formed, were mustered into the service of the United States, when they fell under the direction of the war department, and were assigned to brigades, divisions, corps, and armies, as required. All general and general staff officers received their commissions from the president; line officers being appointed before mustering into the U. S. service. Toward the close of the war the difficulty of obtaining volunteers so increased that large bounties were offered, in some cases amounting to as much as \$1500 for one man. At the close of the war the volunteer army which was mustered out numbered about 1,100,000 men. The regular army was increased during the progress of the war from 18,000 men to 50,000; since the war it has been reduced to 25,000.

On Oct. 15, 1879, the army of the United States comprised 26,389 officers and enlisted men, divided as follows:

	OFFICERS.	ENLISTED MEN.
10 cavalry regiments.....	430	7,206
5 artillery regiments.....	278	2,387
25 infantry regiments.....	851	10,973
Engineer battalion, recruiting parties, ordnance department, hospital service, Indian scouts, West Point, and general service.....	563	3,696
	2,127	24,262

The military arrangement of the country for the distribution of the army is as follows:

1. Military division of the Missouri, commanded by lieut.gen. P. H. Sheridan, headquarters, Chicago; comprehends the departments of the Missouri (gen. Pope); Dakota (gen. Terry); Texas (gen. Ord); and the Platte (gen. Crook). In this division are 8 regiments of cavalry and 18 of infantry.

2. Military division of the Pacific, commanded by maj.gen. Irwin McDowell, headquarters San Francisco; includes the departments of California (gen. McDowell); the Columbia (vacant, 1881); Arizona (gen. O. B. Willcox); includes 1 regiment of artillery, 2 of cavalry, and 4 of infantry.

3. Military division of the Atlantic, commanded by maj.gen. W. S. Hancock, headquarters New York; includes department of the east (gen. Hancock); department of the south (gen. C. C. Augur, Newport Barracks, Ky). There is also the department of West Point. This division includes 4 regiments of artillery and 3 of infantry. Under existing laws the maximum strength of the army is 2,153 commissioned officers, and 25,000 enlisted men. The following table exhibits the existing number of each rank in the army:

Colonels.....	70	First lieutenants.....	580
Lieut.colonels.....	85	Second lieutenants.....	425
Majors.....	242	Chaplains.....	32
Captains.....	535	Store-keepers.....	21
Adjutants.....	79		
Regimental quartermasters.....	32	Total.....	2,101

The enlisted men embrace—

Sergeant-majors.....	38	Sergeants.....	2,011
Quartermaster-sergeants.....	39	Corporals.....	1,600
Musicians.....	644	Farriers.....	231
Trumpeters.....	214	Artificers.....	81
Saddler-sergeants.....	10	Saddlers.....	114
Ordnance-sergeants.....	114	Wagoners.....	48
Hospital stewards.....	187	Privates.....	18,956
Commissary-sergeants.....	151		
First sergeants.....	424		24,262

The number of retired army officers is 388; number of privates discharged during the fiscal year 1879, 4,710; number died during same period, 289; number deserted, 1965; enlisted and re-enlisted, 7,334;

ENTERED THE ARMY.

General of the army.....	William T. Sherman.....	1840
Lieutenant-general.....	Philip H. Sheridan.....	1853
Major-generals (limited by law to 3).....	Winfield S. Hancock.....	1844
	John M. Schofield.....	1853
	Irwin McDowell.....	1858
Brigadier-generals (limited by law to 6).....	John Pope.....	1842
	Oliver O. Howard.....	1854
	Alfred H. Terry.....	1865
	Edward O. C. Ord.....	1839
	Christopher C. Augur.....	1843
	George Crook.....	1852

STATISTICS OF THE UNITED STATES ARMY, 1780-1879.

STRENGTH OF ARMY.			STRENGTH OF ARMY.		
1789.....	1 reg't infantry, 1 bat. art'y.	840	1847.....	Mexican War.....	17,812
1792.....	Indian border wars.....	5,120	1848.....	" ".....	20,800
1794.....	Peace establishment.....	3,620	1849-1855.....	Peace establishment.....	10,320
1801.....	" " ".....	5,144	1856-1861.....	" ".....	12,931
1807.....	" " ".....	3,278	1862.....	Civil war.....	39,273
1810.....	" " ".....	7,154	1863-1866.....	" ".....	43,332
1812.....	War with Great Britain.....	11,831	1867.....	Peace establishment.....	54,641
1815.....	" " ".....	9,413	1868-1869.....	" ".....	52,922
1817-1821.....	Peace establishment.....	9,960	1870.....	" " ".....	37,313
1822-1832.....	" " ".....	6,184	1871.....	" " ".....	35,353
1833-1837.....	" " ".....	7,198	1872-1874.....	" " ".....	32,264
1838-1842.....	Florida war.....	12,539	1875-1879.....	" " ".....	27,489
1843-1845.....	Peace establishment.....	8,613			

PAY OF THE ARMY OF THE UNITED STATES.

GRADE.	Pay of officers in active service.					Pay of retired officers.				
	† Yearly Pay.					† Yearly Pay.				
	\$	10 p. c.	20 p. c.	30 p. c.	40 p. c.					
General.....	13,500									
Lieutenant-general.....	11,000									
Major-general.....	7,500					\$5,625				
Brigadier-general.....	5,500					4,125				
Colonel.....	3,500	3,850	4,200	4,500	*4,500	2,625	2,887	3,150	3,375	3,375
Lieutenant-colonel.....	3,000	3,300	3,600	3,900	*4,000	2,250	2,475	2,700	2,925	3,000
Major.....	2,500	2,750	3,000	3,250	3,500	1,875	2,062	2,250	2,437	2,625
Captain—mounted.....	2,000	2,200	2,400	2,600	2,800	1,500	1,650	1,800	1,950	2,100
Captain—not mounted.....	1,800	1,980	2,160	2,340	2,520	1,350	1,485	1,620	1,755	1,890
Regimental adjutant.....	1,800	1,980	2,160	2,340	2,520					
Regimental quartermaster.....	1,800	1,980	2,160	2,340	2,520					
First lieutenant—mounted.....	1,600	1,760	1,920	2,080	2,240	1,200	1,320	1,440	1,560	1,680
First lieutenant—not mounted.....	1,500	1,650	1,800	1,950	2,100	1,125	1,237	1,350	1,462	1,575
Second lieutenant—mounted.....	1,500	1,650	1,800	1,950	2,100	1,125	1,237	1,350	1,462	1,575
Second lieutenant—not mounted.....	1,400	1,540	1,680	1,820	1,960	1,050	1,155	1,260	1,365	1,470
Chaplain.....	1,500	1,650	1,800	1,950	2,100	1,350	1,485	1,620	1,755	1,890

The medical department of the U. S. army is allowed by law to consist of 1 surgeon-gen., with the rank of brig.gen.; 1 assistant surgeon-gen., with the rank of col. of cavalry; 1 chief medical purveyor; 4 surgeons, with the rank of col.; 2 assistant medical purveyors; 8 surgeons, with the rank of lieutenant-col.; 50 surgeons, with the rank of maj.; 125 assistant surgeons, with the rank of lieuts. of cavalry for the first 5 years' service, and of capt. of cavalry after 5 years' service. No person shall be appointed an assistant surgeon unless he shall have been examined and approved by an army medical board, to consist of not less than three surgeons or assistant surgeons, who shall be designated for that purpose by the secretary of war, and no person shall receive the appointment of surgeon unless he shall have served at least five years as an assistant surgeon. He must also be examined by an army medical board. All candidates for appointment in the medical corps of the army must apply to the secretary of war to be admitted to examination, and such candidates must be between 21 and 28 years of age, and graduates of a regular medical college; and the morals, habits, physical and mental qualifications, and general aptitude for the service are subjects for examination by the board.

UNITED STATES, EXTENSION OF TERRITORY OF THE. Prior to 1781 only six of the 13 original states, viz. New Hampshire, Rhode Island, New Jersey, Pennsylvania, Maryland, and Delaware, had exactly defined boundaries. Of the remaining seven states, some claimed to extend to the Pacific ocean and others to the Mississippi river. The states within exact boundaries ceded their claim to lands w. of their present limits in succession, as follows: March 1, 1781, New York; March 1, 1784, Virginia; the cession including the state of Kentucky and the parts of the states of Illinois, Ohio, and Indiana which lie s. of the 41st parallel. Virginia reserved from this cession for military bounty lands the entire territory, 6,570 sq.m., between the Scioto and Little Miami rivers, from their source to the Ohio river. April 19, 1785, Massachusetts; including her claims to territory w. of the present boundary of New York. Sept. 14, 1786, Connecticut; the cession being the territory between the parallels of 41° and 40° 2', and w. of a north and south line drawn 120 m. w. of the present w. boundary of Pennsylvania. Connecticut then ceded all land and jurisdiction w. of that territory, now situated in Ohio, and yet known as "the western reserve of Connecticut." Aug. 9, 1787, South Carolina; the territory ceded being a strip of land about 12 m. wide, s. of the 35th parallel and extending along the s. boundaries of North Carolina and Tennessee to the Mississippi. Feb. 25, 1790, North Carolina; the cession constituting Tennessee. May 30, 1800, Connecticut; yielding all territory and jurisdiction w. of her present area, and reserving the right of soil in the "western reserve," which lies between the parallels and meridians above recited. June 16, 1802, Georgia receiving that part of the cession of South Carolina lying within her present limits, ceded all between her present w. boundary and the Mississippi, and between the South Carolina cession and the 31st parallel. The foregoing cession secured to the general government all territory ceded by Great Britain, not included in the original 13 states, as in the main now bounded. Nov. 25, 1850, the state of Texas ceded all her claims to lands w. of the 26th meridian (103d Greenwich) and between 32° and 36° 30' of latitude.

CESSIONS BY FOREIGN POWERS.—Sept. 3, 1783, by treaty with Great Britain, the territory of the United States was declared to extend from the Atlantic ocean w. to the Mississippi river, and from a line along the great lakes on the n. to the 31st parallel and the s. border of Georgia. April 30, 1803, by treaty with France, the "province of Louisiana" was ceded. Its w. boundary as finally adjusted, Feb. 22, 1819, by treaty

* The maximum pay of colonels is limited to \$4,500, and of lieutenant-colonels to \$4,000.

† The different columns show the increase with every five years of service.

with Spain, ran up the Sabine river, to and along the 17th meridian (94th Greenwich), to and along the Red river, to and along the 23d meridian (100th Greenwich), to and along the Arkansas river, to and along the Rocky mountains, to and along the 29th meridian (106th Greenwich), to and along the 42d parallel, to the Pacific ocean. Its n. boundary was conforming to the boundary established between the British possessions and the United States. On the e. it was bounded by the Mississippi as far s. as the 31st parallel, where different boundaries were claimed. The United States construed the cession of France to include all the territory between the 31st parallel and the gulf of Mexico, and between the Mississippi and Perdido, the latter of which is now the western boundary of Florida. Under this construction of the cession, the "province of Louisiana" is now covered by those portions of the states of Alabama and Mississippi which lie s. of the 31st parallel; by Louisiana, Arkansas, Iowa, Nebraska, Oregon, Minnesota w. of the Mississippi, and Kansas; by the territories of Dakota, Montana, Idaho, Washington, and that known as Indian country; and by the portion of Colorado lying e. of the Rocky mountains and n. of the Arkansas river, and all of Wyoming n. of the 42d parallel, and that portion of Wyoming which is s. of that parallel and e. of the Rocky mountains. In 1800, however, the "province of Louisiana" had been ceded by Spain to France, Spain claiming that she ceded to France no territory e. of the Mississippi except the "island of New Orleans," and also contending that her province of west Florida included all of the territory s. of the 31st parallel and between the Perdido and Mississippi, except the "island of New Orleans." Under this construction, the "province of Louisiana" included on the e. of the Mississippi only the territory bounded on the n. and e. by the "rivers Iberville and Amite and by the lakes Maurepas and Ponchartrain." Feb. 22, 1819, Spain formally ceded the territory now covered by Florida and by portions of Alabama, and Mississippi, which lie s. of the 31st parallel, and by that portion of Louisiana which lies e. of the Mississippi and is not included in the "island of New Orleans." This territory was styled by Spain the "provinces of East and West Florida." Previous to this cession, by the authority of the joint resolution of Jan. 15, 1811, and the acts of Jan. 15, 1811 and Mar. 3, 1811, passed in secret session and first published in 1818, the United States had taken possession of the East and West Floridas. By treaty of Jan. 12, 1828, between the United States and the United Mexican states, the boundary of the "province of Louisiana," which was established by treaty with Spain when Mexico was a part of the Spanish monarchy, was agreed upon as the boundary between the two republics. Dec. 29, 1845, Texas, formerly a portion of Mexico, and later an independent republic, was admitted to the union. Feb. 2, 1848, Mexico ceded the territory now covered by California and Nevada; also her claims to the territory covered by the present Texas, by Utah, Arizona, and New Mexico, by portions of Wyoming and Colorado, and by the unorganized territory w. of the Indian country, except that part of Arizona and that part of New Mexico lying s. of the Gila and w. of the old boundary of New Mexico, which lands were ceded by Mexico Dec. 30, 1853, and are known as the Gadsden purchase. By treaty of March 30, 1867, exchange of ratification and transfer of title having been made June 20, 1867, Russia ceded Alaska. This cession made the line between the continent of Asia and America the n.w. boundary of the territory of the United States, and extending the territory of the United States northward to the Arctic ocean. On the e. this cession was bounded by a line beginning at the s. point of Prince of Wales island (parallel 54° 40') and running n. along Portland channel to the junction of the 56th parallel of n. latitude with the continent, and thence along the summit of the mountains parallel to the coast, to and along the 141st meridian to the Arctic ocean. But where the crest of the mountains skirting the coast from the specified parallel to the meridian is more than ten marine leagues from the ocean, there the boundary is a line not more than ten marine leagues from the coast and parallel to its windings. This cession is separated from the main territory of the United States by the w. part of the British possessions between the parallels of 54° 40' and 49° n. latitude. At the close of the revolutionary war the territory really occupied by the old 13 states covered scarcely a quarter of a million sq.m.; according to the most trustworthy measurements and estimates in 1870 the land surface was 3,603,884 sq.m., and the water areas included made an area in round numbers of 4,000,000 sq.m., or 2,560,000,000 of acres.

UNITED STATES MILITARY ACADEMY, West Point, N. Y., founded by act of congress approved Mar. 16, 1802. The experience of the country in the war of the revolution convinced Washington and other statesmen of the need of such an institution, and the act above referred to was the result of much thought and discussion. The special object of the academy is to fit young men for appointment as officers of the army. It combines in one school all the purposes usually aimed at in the several schools of engineering and other military branches in foreign countries. Its graduates, upon receiving diplomas, are recommended for, and usually appointed into, the corps or arm of service in the army for which their qualifications fit them. It has no endowment, but is maintained by annual appropriations. It is beautifully located in the highlands upon the w. side of the Hudson river, at a point which, during the war of the revolution, was deemed of great military strength and strategic importance. Its buildings, valued at \$2,500,000, stand upon a plateau of 160 acres, flanked by mountains at the w. and n., and elevated 180 ft. above the river. The chemical and ordnance labora-

ories, and the apparatus pertaining to the department of natural and experimental philosophy, are complete. The library contains 27,472 vols. and over 2,000 pamphlets. One cadet is allowed by law to be appointed from each congressional district; also one from the district of Columbia, and one from each territory; and ten "at large" are appointed by the president of the United States. The appointments (excepting those *at large*) are made by the secretary of war at the request of the representative, or delegate, in congress from the district or territory; and the person appointed must be an actual resident of the district or territory from which the appointment is made. Candidates must be between 17 and 22 years of age, and must be at least 5 ft. in height, and free from any infectious or immoral disorder, and, generally, from any deformity, disease, or infirmity which may render them unfit for military service. They must be well versed in reading, in writing, including orthography, and in arithmetic, and have a knowledge of the elements of English grammar, of descriptive geography, particularly of our own country, and of the history of the United States. The course of study occupies four years, and the teaching is very thorough. Examinations are held semi-annually, and no cadet is graduated without having passed a satisfactory examination in all the branches taught. The institution, during the first ten or fifteen years of its existence, was of a tentative character; but in 1817 its organization began to improve under the superintendence of maj. Sylvanus Thayer, who administered its affairs for 16 years with great success. In many of its best features the institution is to-day what it became under his management. The mode of selecting the cadets, while it serves to awaken and diffuse an interest in the institution in every part of the country, is not perhaps so well adapted to secure the highest order of ability. There is a constant tendency, difficult to be resisted, to make appointments on political or local grounds; and it is doubtless owing to this that so large a proportion of the cadets fail to reach the high standard of scholarship requisite for graduation. The monthly pay of cadets at first was \$28 per month; it is now about \$50. On this sum they are required to support themselves without aid from other sources. A board of visitors, consisting of seven persons appointed by the president of the United States, two senators appointed by the president of the senate, and three representatives appointed by the speaker of the house, attends the annual examinations and makes an annual report on the condition of the academy. The number of professors (1880) is 9; other instructors are assigned by the war department from time to time as they are needed. The average number of students since 1876 has been about 270. Each cadet is required to pledge himself to serve the United States eight years from the date of his admission unless sooner discharged. Maj.gen. Oliver O. Howard is (1881) the superintendent.

UNITED STATES NAVAL ACADEMY, founded in 1845, and opened at Annapolis, Md., on Oct. 10, in that year. The idea originated with George Bancroft, who was secretary of the navy in the cabinet of pres. Polk; and the institution was at first called the naval school, under the direction of commander Franklin Buchanan. It occupied fort Severn, with its grounds and buildings, which had been transferred for the purpose from the war to the navy department; and though the barracks and other minor buildings have since been removed, the old fort and officers' quarters, with about 160 acres of land, are still appropriated to the uses of the academy. The institution bears the same relation to the U. S. navy, that the military academy at West Point does to the army. Its pupils are chosen under special provisions of the law, and educated expressly for the naval service. It resembles in its purpose and methods the royal naval college at Greenwich, Eng.; the *ecole navale* at Brest, France; and the marine academy and school at Kiel, in Germany. After numerous changes in the nature and length of the studies at the academy, a course of four years was adopted in 1851, to be followed by sea-service as a midshipman; the length of the latter term being fixed at two years in 1873. From May, 1861, to Sept., 1865, during the war of the rebellion, the academy was temporarily placed at Newport, R. I. The naval academy is under the general patronage and control of the U. S. government, and is governed by special acts of congress, and by regulations established by the secretary of the navy. Candidates for cadet-midshipmen are appointed by this official, from the congressional districts, on nomination by members of the house of representatives. Ten candidates at large are appointed by the president. Candidates for cadet-engineers are chosen by the secretary of the navy without limitation as to number or residence, and from the whole number so chosen, twenty-five are selected on competitive examination, for admission to the academy. The academy is sustained by an annual appropriation by congress, which usually amounts to about \$184,000; this is exclusive of the pay of naval officers acting under appointment as instructors, etc., which amounts to \$140,000 per annum; while the pay of cadets averages \$200,000; the whole being included in the general congressional appropriation. The buildings include cadets' quarters; physical and chemical laboratories; a steam-engineering department, observatory, gunnery-hall, seamanship hall, recitation hall, chapel, library, armory, gymnasium, store, and hospital. Attached to the academy for purposes of drill and practical exercise, are the frigate *Santee*, used as a gunnery ship; the *Constellation*, for summer cruising; the sloop-of-war *Dale*, for exercises in seamanship; the monitor *Nantucket*; and two steam gun-boats. The collection of working models of vessels of war, etc., is remarkably complete; and there is an ample supply of

all needed apparatus and appliances for professional and general scientific instruction; including a thoroughly appointed astronomical observatory. The officers of the academy are the superintendent, commandant of cadets, 4 commanders, 5 lieutenant-commanders, 22 lieutenants, 5 masters; 8 engineer officers, 9 professors, 7 assistant professors, and 4 fencing and boxing masters. The superintendent, commandant of cadets, and ten heads of departments form the academic board. There are also 3 surgeons, 3 paymasters, a chaplain, secretary, librarian, and 3 marine officers, attached to the station. The number of students is 355, including 256 cadet midshipmen, and 99 cadet engineers. The average annual number of graduates is 41; the total number since 1851 has been 1149. The curriculum, besides subjects in general education, chosen for their usefulness to the naval profession, includes seamanship, ordnance and gunnery service, navigation, and steam engineering. Graduates from the naval academy receive appointments, as midshipmen or assistant engineers in the U. S. navy. The present superintendent of the academy is rear-admiral George B. Balch.

UNITED STATES NAVY. The Americans were a maritime people from the time of the first settlement of the colonies; and, as maritime commerce was conducted in the 17th c. in the midst of constant danger from pirates, Indians, and freebooters, all vessels sailing out of American ports were armed; while most of the colonies fitted out special armed vessels for the general protection. In 1690 Massachusetts colony fitted out eight armed vessels against the French privateer of Acadia; and in the same year a squadron of 40 vessels, with 2,000 men, also from Massachusetts, made an unsuccessful descent on Quebec. The beginning of the 18th c., and the occurrence of the French war, brought the American colonies into hostilities, and the crown and colonists acting together, expeditions were fitted out against the French, and a considerable American navy temporarily organized. After the peace of Utrecht in 1713, this force was reduced to a few armed vessels employed to guard the coast. In 1739 England declared war against Spain, and many expeditions were fitted out in the colonies, notably that against Cartagena. In 1741 a similar enterprise was undertaken against Cuba, and four years later the expedition against Louisburg, in aid of the new British war against France. In this war there were as many as 400 privateers and letters-of-marque engaged on the part of the colonies. The French and English war of 1756 again involved the colonies, and numerous brilliant naval exploits on the part of the colonial navy are recorded in its history. After the peace of 1763, no further call for armed vessels was made on the colonies, until the breaking out of the war of the revolution. At this period (1775) there existed no naval force whatever in the American colonies; and although Massachusetts fitted out a few privateers at the beginning of hostilities, it was not until six months after the battle of Lexington that congress took steps to organize a navy. Two small cruisers were equipped to intercept British supply ships; then two more, of a larger class; and by the close of the year the construction of about 20 cruisers had been authorized. The first ensign displayed by a regular American man-of-war was hoisted by John Paul Jones, in Dec., 1775, on board the *Alfred*, of which he was 1st lieutenant, that ship then lying in the Delaware. It is believed that this flag contained the device of a pine-tree, with a rattlesnake at its root, about to strike, and the motto "Don't tread on me!" The present national ensign did not come into use until 1777 and is generally believed to have originated in the arms of the Washington family, as displayed on gen. Washington's headquarters' flag. The first American squadron consisted of eight vessels, including the *Alfred*, and sailed on Feb. 17, 1776, on a cruise against the British naval force then ravaging the coast of Virginia. This cruise was unsuccessful, and the officer in command, commodore Ezek Hopkins, was dismissed from the service. Paul Jones, who was promoted to command of the *Providence*, 12 guns, atoned for this ill-fortune, in a measure, by capturing 16 prizes in a single cruise. After the declaration of independence, congress set vigorously to work to construct a navy; authorizing in 1776-77 the building of 7 frigates, 2 cutters, 2 sloops-of-war, and three 74-gun ships. At the same time congress regulated the rank of the different officers, and 24 captains were appointed to take precedence as their names stood on the list. The new navy did good work; not only as coasters, and upon the high seas, but by descents on the coast of the British isles. The bold expedition of Paul Jones, with a squadron of which the *Bon Homme Richard* was the flagship, is historical. Meanwhile armed flotillas did good service on the great lakes, as to which brilliant exploits are recorded. On the ocean no less than 342 vessels were captured from the British during the first year of the war. During the second year they lost 467 merchantmen, captured by American cruisers and privateers. In 1779 the American navy encountered many disasters; and the three last years of the war witnessed no important naval engagements. The determination of the British government to exchange no more prisoners captured in American privateers demoralized that system of naval warfare, and but a few of that class of vessels remained; while the continental navy became greatly diminished. It is, however, the fact that British shipping suffered more heavily in this contest than in any other war in which England had previously been engaged. After the peace of 1783, what few public cruisers remained to the Americans were sold by order of the government. But about 1794, difficulties having broken out with the Barbary States, congress authorized the construction of 6 frigates, and these were speedily built, including the *United States* and the immortal *Constitution*.

In 1798 anxiety regarding the apparently impending war with France induced the American government to build 20 small armed vessels; and in this year the department of the navy was created, Benjamin Stoddart being its first secretary. Other ships were ordered, and on July 11, 1798, the formation of the marine corps was authorized. Before the close of this year 23 American men-of-war were at sea; and the capture of the French frigate *L'Insurgente* by the *Constellation* aroused the greatest enthusiasm: this was the first occasion since the establishment of the federal navy, when a national vessel had subdued one of equal force. In the beginning of 1800 the American government had a navy of 34 men-of-war at sea. Early in the following year peace with France was declared, and at once the government proceeded to sell the greater number of these ships—from a very mistaken theory of necessary economy. Hostilities with Tripoli began soon after the amicable settlement with France, and a squadron under commodore Dale blockaded Tripoli, and captured several neutrals attempting to enter that port. Hostilities were not concluded until the summer of 1805, many important captures having been in the meantime effected; the town of Tripoli bombarded and nearly captured; and good work having been accomplished in awakening the *esprit de corps* which has characterized the American navy ever since. From this period until 1812, the duty of American ships-of-war was confined chiefly to guarding the coast. In the latter year broke out the war with England, the American navy then consisting of but 17 efficient vessels, of which only 8 were frigates. The splendid capture of the British frigate *Guerriere* by the *Constitution* on Aug. 19, 1812, awakened renewed enthusiasm, however; and this was followed by that of the *Frolic* by the American sloop *Wasp*, and by the American frigate *United States* capturing the British frigate *Macedonian*—three most spirited and well-matched encounters. Early in 1813 congress ordered the building of 4 ships of the line and 6 frigates, to be immediately followed by the construction of 6 sloops-of-war; only the sloops, however, were completed in time to be of service in this war. The general success of the Americans on the sea during the war of 1812 was equalled by the occurrence of splendid victories on lake Erie and lake Champlain; and the reputation of the American navy was greatly increased, while that of the British was correspondingly diminished. This war was followed by a brief period of hostilities against Algiers; and from that time to the outbreak of the Mexican war, America was at peace with all the world. Meanwhile its navy was kept in a condition of efficiency; four squadrons were retained in the Mediterranean, Pacific, on the coast of Brazil, and in the West Indies; and in 1841 a home squadron was created to cruise on the coast of the United States. By this means the dignity of the nation was for a time maintained in every part of the world, and American commerce everywhere protected. The Wilkes government exploring expedition formed an incident of this period, which raised the United States to the front rank among nations which devoted their naval resources in time of peace to scientific investigation.

The war with Mexico, which broke out in 1846, at once proved the value of the more recent system of keeping U. S. squadrons on service in the different waters. The squadron in the gulf proceeded to blockade Vera Cruz; while that in the Pacific was ordered to the California coast and seized Monterey and Los Angeles. At Vera Cruz the navy now kept up an incessant bombardment of the fort of San Juan de Ulloa, which was eventually captured; there was no other important use made of the navy in this war. The Japan expedition under the command of com. Perry, which was sent out by the government in 1852, was an important event in connection with opening up the ports of that country to western commerce, and its court to western diplomacy. The outbreak of the rebellion found the American navy scattered far abroad, and of practically little value had it been attainable, owing to the peculiar nature of the warfare in which the north and south were now about to be engaged. The character of naval warfare had long before this totally changed. The great improvements in ordnance and projectiles had rendered the old wooden ships useless; and the application of steam power to the navy had been accomplished. But the American steam frigates were incompetent to resist the force of the Whitworth and other modern guns of long range and heavy caliber. The emergency, brought forth the necessary inventive faculty, whose expression in the turreted iron-clad was the means of saving the north from ignominious failure at a most desperate moment. The operations of the U. S. navy during the war of the rebellion will be found fully set forth under the titles REBELLION, UNITED STATES, etc.

The condition of the navy, Dec. 1, 1879, showed 45 vessels in commission; 16 of which could be made ready with slight repairs; and 19 which might be fitted out in an emergency by the proper appropriation—80 vessels in all. Besides these were 4 iron-clad monitors to be finished, and 8 tugs, a total of 92 vessels. The active list of the navy includes 1 admiral, 1 vice-admiral, 11 rear-admirals, 23 commodores, 49 captains, 90 commanders, 79 lieut.-commanders, 280 lieutenants, 100 masters, 100 ensigns, 53 midshipmen, 35 cadet-midshipmen, all of whom are officers of the line. Of the staff there are 1 surgeon-general, 15 medical directors, 15 medical inspectors, 50 surgeons, 59 passed assist.-surgeons, 39 assist.-surgeons, 1 pay-master general, 13 pay directors, 13 pay inspectors, 50 paymasters, 30 passed assistant-paymasters, 20 assist. paymasters, 1 engineer-in-chief, 69 chief-engineers, 95 passed assist.-engineers, 41 assist.-engineers, 41 cadet-engineers, and 104 cadet-engineers on probation at the naval academy, 24 chaplains, 12 professors of

mathematics, 1 secretary for the admiral and 1 for the vice-admiral, 1 chief constructor, 11 naval constructors, 5 assistant-constructors, and 9 civil engineers. The active list is composed of 1075 officers of the line; 721 officers of the staff; and 247 warrant officers—in all 2,043 officers of all grades. There were in 1879 in the service provided for by the navy appropriation act for the fiscal year 1880, 7,500 enlisted men and boys.—The navy-yards of the United States are the Brooklyn navy yard, Brooklyn, L.I.; Charlestown, Boston, Mass.; Gosport, near Norfolk, Va.; Kittery, opposite Portsmouth, N. H.; League Island, 7 m. below Philadelphia; Mare island, near San Francisco, Cal.; New London, New London, Conn.; Pensacola, Pensacola, Fla.; and Washington city, Washington, D.C.

PAY TABLE OF THE NAVY.

	At sea.	On shore duty.	On leave or waiting orders.
Admiral.....	\$13,000	\$13,000	\$13,000
Vice-Admiral.....	9,000	8,000	6,000
Rear-Admirals.....	5,000	5,000	4,000
Commodores.....	5,000	4,000	3,000
Captains.....	4,500	3,500	2,500
Commanders.....	3,500	3,000	2,300
Lieut. Commanders.....			
" " first 4 years.....	2,800	2,400	2,000
" " after 4 years.....	3,000	2,600	2,200
Lieutenants, first 5 years.....	2,400	2,000	1,600
" after 5 years.....	2,600	2,200	1,800
Master, first 5 years.....	1,800	1,500	1,200
" after 5 years.....	2,000	1,700	1,400
Ensigns, first 5 years.....	1,200	1,000	800
" after 5 years.....	1,400	1,200	1,000
Midshipmen.....	1,000	800	600
Cadet-Midshipmen.....	500	500	500
Mates.....	900	700	500
Medical and pay directors, and inspectors and chief engineers having the same rank at sea.....	4,400		
Fleet surgeons, paymasters and engineers.....	4,400		
Surgeons, paymasters, and chief engineers, first 5 years.....	2,500	2,400	2,000
" second 5 years.....	3,200	2,800	2,400
" third 5 years.....	3,500	3,200	2,600
" fourth 5 years.....	3,700	3,600	2,800
" after 20 years.....	4,200	4,000	3,000
Passed ass't.-surgeons, paymasters, and engineers, first 5 years.....	2,000	1,800	1,500
" after 5 years.....	4,200	2,000	1,700
Ass't.-surgeons, paymasters and engineers, first 5 years.....	1,700	1,400	1,000
" after 5 years.....	1,900	1,600	1,200
Chaplains, first 5 years.....	2,500	2,000	1,600
" after 5 years.....	2,800	2,300	1,900
Boatswains, gunners, carpenters, and sailmakers, first 3 years.....	1,200	900	700
" second 3 years.....	1,300	1,000	800
" third 3 years.....	1,400	1,200	900
" fourth 3 years.....	1,600	1,300	1,000
" after 12 years.....	1,800	1,600	1,200
Cadet engineers (after examination).....	1,000	800	600

The medical department of the United States navy is by the revised statutes made to consist of 15 medical directors with the relative rank of capt.; 15 medical inspectors with the relative rank of commander; 50 surgeons with the relative rank of lieutenant-commander and lieutenant, the numbers of each class depending on circumstances; and 100 assist.-surgeons, with the relative rank of lieutenant and of ensign, the numbers of each class depending upon circumstances. On Jan. 1, 1881, there were 72 passed assist.-surgeons, of whom 29 had the relative rank of lieutenant, and 43 the relative rank of master; and 19 assist.-surgeons, with the relative rank of ensign. There is a surgeon-general with the relative rank of commodore. The custom is to appoint the surgeon-general from the senior officer among the medical directors, but the present surgeon-general (1881) was appointed from the list of inspectors. Under ordinary events he will be retired when he vacates the office of surgeon-general, and will return to the list of inspectors and be placed on the retired list. All appointments in the medical corps of the navy are made by the president by and with the advice and consent of the senate, and no person can be appointed an assist.-surgeon until he has been examined and approved by a board of naval surgeons, designated by the secretary of the navy, nor who is under 21 or over 26 years of age, and no person can be appointed a surgeon until he has served as an assist.-surgeon 3 years, nor until he has been examined and approved for such appointment by a board of naval surgeons designated by the secretary of the navy, when he becomes a passed assist.-surgeon. It is not necessary, as in the army, that the applicant shall be a graduate of a medical college.

UNITED STATES OF COLOMBIA. See NEW GRANADA, and COLOMBIA, *ante*.

UNIVALVES, in conchology, are those shells which consist of only one piece. They are mostly the shells of gasteropodous mollusks, but some cephalopodous mollusks also

have univalve shells, as the argonaut and nautilus, and even animals belonging to other divisions of the animal kingdom, particularly a few annelids, as *serpula*; and the *foraminifera*. In systems of conchology, when the shell alone was regarded, the usual division of univalves was into *unilocular* and *multilocular*, the latter being the shells divided into chambers, as in the nautilus. The whole arrangement, however, was unnatural, bringing together in one group creatures widely different, and separating groups which in reality are very closely allied; for the mere presence or absence of a shell is often comparatively an unimportant circumstance, as in the case of snails and slugs. Yet by the mere shell, recent or fossil, the naturalist knows the group and order to which its occupant belonged, and can pronounce with confidence as to some of the habits of the animal. There are marked peculiarities in the univalves of different geological periods, well known and of great interest to geologists. See GASTEROPODA and MOLLUSKA.

UNIVERSALISTS, a body of Christians whose distinctive peculiarity consists in their belief that "evil" will ultimately be eradicated from the world, and that all erring creatures will be brought back to God through the irresistible efficacy of Christ's divine love. The grounds on which their faith in the final salvation of all men rests are derived more, perhaps, from reason than from Scripture; and when they *do* appeal to the latter, it is rather to the spirit and design of the Gospel than to particular passages. They argue, that when an infinitely wise, holy, and benevolent God resolved to create man, it could only be with a view to his everlasting good; that if he did allow him to be tempted and fall, it must have been because he foresaw that through sorrow and suffering man could rise to higher degrees of perfection; that therefore all punishment (or what, with our limited knowledge, we conceive to be such) is of necessity designed as a remedial agent, and not intended to satisfy God's indignation as a sovereign at the disobedience of his subjects; that no other view of the subject is compatible with the Scriptural, and especially the New Testament representation of God as a "Father," or with the oft-repeated declaration (in various terms) that Jesus Christ was a propitiation for the sins of the whole world. In answer to those who adduce against them the express language of Scripture; e.g., "And these shall go away into everlasting punishment: but the righteous into life eternal" (Matthew, xxv. 46), they reply, that the word *aiōnios*, translated "everlasting," does not necessarily bear that signification; that properly it does not express the idea of duration at all, either finite or infinite, but was rather used by the sacred writers to denote a mode of existence distinct from and wholly dissimilar to any mere *chronic* state; in proof of which they point to such passages as—"This is life eternal, that they might know thee, the only true God, and Jesus Christ, whom thou hast sent" (John, xvii. 3), where eternal life is affirmed to be *knowledge*—that is, a present state of mind; and not a perpetual hereafter of duration.

Universalists, it may be observed, generally differ from the prevalent bodies of Christians in other important doctrines, though it is not because of such differences that they have received their name, nor is it necessary to merit the name that one should share these differences. Most of them agree with Unitarians—but there are eminent examples to the contrary—in rejecting the doctrine of the trinity; they are also Pelagian in the matter of original sin, and reject the notion that the new birth is something supernatural.

Universalism, as a mode of belief, is of very ancient origin, and its modern adherents, besides urging its congruity with the divine plan of redemption, as revealed in Scripture, point to the earliest Christian writings; e.g., the *Sibylline oracles* (150 A.D.—see *SIBYL*)—expressly composed to convert pagans to Christianity—as evidence that the doctrine was recognized from the first. Passages in favor of the doctrine are cited from many of the church fathers—Clemens Alexandrinus; Origen; Marcellus, bishop of Ancyra; Titus, bishop of Bostra; Gregory, bishop of Nyssa; Didymus the Blind, president of the Catechetical School of Alexandria; Diodorus, bishop of Tarsus; Theodore, bishop of Mopsuestia; and Fabius Marius Victorinus. It is said to have been held by some of the Albigenses and Waldenses, the Lollards and the Anabaptists, and it probably had isolated supporters in most of the countries into which the reformation penetrated. Nor has it wanted illustrious adherents belonging to the church of England and the Non-conformists, among whom it is customary to rank archbishop Tillotson, Dr. Burnet, bishop Newton, Dr. Henry More, William Whiston, Jeremy White (chaplain to Oliver Cromwell), Soame Jenyns, David Hartley, William Law, and (in our own day) Thomas de Quincy and professor Maurice. The same remark is applicable to the French Protestant and German churches, and indeed it may safely be asserted that the *non-clerical* mind in all ages is disposed to look favorably upon the doctrine of the universal restoration to holiness and happiness of all fallen intelligences, whether human or angelic. Hence the irrepressible sympathy of men, however orthodox, with the language of Burns:

Then, fare ye weel, auld Nickie Ben,
Oh, wad ye tak a thocht, and men,
Ye aiblins micht—I dinna ken—
Still hae a stake.
I'm wae to think upo' yon den,
E'en for your sake.

But the existence of Universalism as a distinct religious sect is a feature of American rather than of English religious society. About the year 1770, the rev. John Murray became a propagator of Universalist views; and since his time, an organized body has

sprung up, which contains many able, learned, and pious divines. According to the "Register" of the denomination published in 1871, there are in the United States, 904 societies, owning 687 churches, and ministered to by 621 preachers. These societies have under their patronage 11 institutions of learning, including 4 colleges and 7 academies, and they support 13 periodicals. Various missionary, tract, and Sunday school associations are also employed in teaching and propagating their peculiar views. See *Ancient History of Universalism*, by the rev. Hosea Ballou; and the *Modern History*, by the rev. Thos. Whittemore (Bost. 1830; new edit. 1860 *et seq.*).

UNIVERSALISTS (*ante*), claim that their doctrine was preached in America by Dr. George de Benneville in 1741; that the rev. Richard Clarke, an Episcopal clergyman of Charleston, S. C., maintained it for many years; and that Dr. Mayhew, a Congregational pastor in Boston, advocated it in 1762. The first Universalist church in the United States was organized by the rev. John Murray, Gloucester, Mass., 1780. The first convention of Universalist ministers and parishes was held in 1785, and was followed by the general convention, whose present organization was formed in 1870. It secures a uniform system of fellowship, and is the ultimate tribunal. The state conventions have jurisdiction over clergymen and parishes within their respective limits, subject to the right of appeal. The Winchester confession, adopted in 1803, is as follows: "I. We believe that the holy Scriptures of the Old and New Testament contain a revelation of the character of God, and of the duty, interest, and final destination of mankind. II. We believe that there is one God, whose nature is love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness. III. We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practice good works; for these things are good and profitable unto men." "Accepting this confession, the Universalist church claims to be thoroughly Christian in belief, holding inflexibly to the authority of the Bible, the divine mission and office of Christ, the absolute necessity of a holy life, the certainty of a just retribution for sin, and the assurance of the final triumph of good over evil, and holiness over sin, in all worlds, and all souls." The general convention holds funds (amounting in 1878 to \$132,000), the interest of which is appropriated for the education of candidates for the ministry, and for the support of missions. In fellowship with the general convention there are (1878) 23 state conventions, 73 associations, 863 parishes, 711 ministers, 4 colleges, of which Tufts college, Medford, Mass., has an endowment of \$1,000,000; St. Lawrence university, Canton, N. Y., \$225,000; Buchtel college, Akron, Ohio, \$300,000; 2 theological seminaries, 6 academies, one of which, Dean academy, Franklin, Mass., has resources amounting to \$350,000.

UNIVERSAL LEGATEE is a legatee to whom the whole estate of a deceased party in Scotland is given, subject only to the burden of other legacies and debts. It nearly corresponds to residuary legatee common to English and Scotch law.

UNIVERSITY (Lat. *universitas*, corporation), a corporation of teachers or students instituted for the promotion of the higher education. Mr. Kirkpatrick, in his *Historically Received Conception of a University* (Lond. 1857), points out the prototype of the universities of modern Europe in the schools of Isocrates and Plato at Athens, and the museum at Alexandria. These institutions certainly much resembled the university of after-times, both in their objects and their organization; and in Greece and Rome, as well as in the later Byzantine empire, something analogous to the degree was conferred on those who had successfully passed through the *trivium* or *quadrivium*, which together comprised what was regarded as the seven liberal arts and sciences. The university is, however, usually considered to have originated in the 12th or 13th c., and to have grown out of the schools which, prior to that period, were attached to most of the cathedrals and monasteries, providing the means of education both to churchmen and laymen, and bringing together the few learned and scientific men who were to be found in Europe. Such an institute of the higher learning was at first called *studium* or *studium generale*. When a teacher of eminence appeared, such as Abelard or Peter Lombard at Paris, or Irnerius at Bologna, a concourse of admiring students flocked round him; and the members of the *studium generale* formed themselves, for mutual support, into a corporation, on which the general name of *universitas* came to be bestowed. In this way the oldest universities arose spontaneously. The crowds drawn from every country of Europe to Paris, Bologna, and other educational resorts, had first local immunities bestowed on them for the encouragement of learning, and to prevent them removing elsewhere; and the academical societies thus formed were, by papal bulls and royal charters, constituted an integral part of the church and state. One great difference existed between the constitution of the two most important universities of early times. In Paris the teachers alone constituted the corporation; in Bologna the university consisted of the students or scholars, who at first held the supreme power, and appointed the academic officials. In this respect Bologna became the model of the subsequent universities of Italy and the provincial universities of France, which were corporations of students; while the universities of Britain, Germany, Holland, and Scandinavia were, like Paris, corporations of teachers, and the Spanish universities occupied an intermediate position. Along with a general resemblance, there was much difference in the constitution and character of the

pre-reformation universities, the form of each being the result of a combination of various circumstances and ideas acting on an originally spontaneous convocation of teachers and scholars.

The several *faculties* of a university are subordinate corporations, consisting of the aggregate of students or teachers in a particular department of knowledge. The number of faculties has varied much in different universities. The university of Paris had at first only a faculty of arts, which, as early as 1169, existed as a separate body, with an organization of its own. Faculties of theology, medicine, and canon law were added in the 13th century. Bologna was at first exclusively, as it continued to be pre-eminently, a school of law. Oxford and Cambridge, in their origin, existed only in the faculty of arts. Some of the smaller French universities, as Orleans and Montpellier, were prohibited from teaching theology, lest they should become rivals to Paris. See UNIVERSITY OF FRANCE.

The granting of degrees was the mode in which the university reproduced itself. A degree is the recognition of a student having made a certain advance in his career, the degree of doctor or master, in its original idea, entitling the person on whom it was conferred to teach within the limits of the university. Toward the end of the 13th c., pope Nicholas I. granted to the university of Paris the right of endowing its graduates with the power of teaching everywhere; and this universal degree, making the recipient of it a member of the community of the learned throughout Christendom, became a link of connection between the universities of Europe. The designation of *bachelor*, borrowed from the term indicating the probationary stage of knight-hood, and implying the lowest stage of university honor, or the condition of an imperfect graduate, was first introduced in the 13th c. in the university of Paris, where the bachelor, though intrusted with certain tutorial functions, possessed no legislative power. The right of teaching (*regendi*) belonged to the master, doctor, or other perfect graduate; and a period of necessary regency was generally fixed, during which the graduates were bound to teach, and after the expiry of which they were at liberty to become non-regents. It, in the course of time, became the practice to endow a select number of the graduates as public authorized teachers; these privileged and salaried graduates were designated *professors*, and instruction by professors more or less supplanted the original plan of teaching by graduates.

The poverty of a proportion of the students, and the desirableness of domestic superintendence, suggested the institution of halls endowed with property and corporate privileges, called *colleges*. Though originally a provision for poor scholars, they soon assumed the character of boarding-houses for all classes of students, where they were privately trained and prepared for the public lectures. Colleges seem to have been first introduced in Paris, where most of them became appropriated to a particular faculty, or department of a faculty. The college of the Sorbonne, founded in 1250, came to be in a great measure identified with the theological faculty. Regent masters were named by the faculties as lecturers in the colleges, attendance on whom was made equivalent to attendance on the public courses in the schools of the university, and eventually the college lectures were thrown open to all members of the university; and it became obligatory in the faculty of arts, and usual in the other faculties, to become a member of some college.

The two highest university officers have generally been the *rector* and the *chancellor*, the former being the head of the university in everything except the granting of degrees, which are conferred by the latter as the fountain of honor. Besides the division into faculties, there was in most of the continental universities a division of the graduates and students into *nations*, in respect of the countries to which they belonged. In Paris, the faculty of arts was divided into four nations, known as French, Picard, Norman, and German or English; and after the 13th c., these four nations, under their respective procurators, and the three subsequently added faculties under their deans, constituted the seven component parts of the university. The rector, with the procurators and deans, formed a court having cognizance of all matters relating to discipline, from which there was an appeal to the university, and from thence to the parliament of Paris. In Bologna, after faculties of philosophy, medicine, and theology had been added to those of civil and canon law, the students were classed as *ultramontani* and *citramontani*, and each class divided into nations, presided over by their several counselors or procurators.

The university, with modifications called for by the altered circumstances of society, has survived the revolutions of seven centuries. At present Europe possesses about 100 universities, some dating from the 12th and 13th centuries, and others of various degrees of antiquity, including some founded in the present century. About 30 belong to Germany, and 20 to Italy; Holland, Belgium, Scandinavia, Spain, Portugal, Russia, and Greece contain among them about 30 universities. England has four—two ancient, Oxford and Cambridge; and two modern, London and Durham. Scotland has the four universities of St. Andrews, Glasgow, Aberdeen, and Edinburgh; and Ireland has Trinity college, Dublin, and the three affiliated colleges of the Queen's university.

Of the universities of Germany, the oldest are Prague, founded in 1348, and Vienna, in 1365. Heidelberg dates from 1386; Leipsic, 1409; Tübingen, 1477; Jena, 1558; Halle, 1694; Göttingen, 1737; Berlin, 1810; and Bonn, 1818. The chief administrative body of the German universities is the *senatus academicus*, composed of the ordinary profes-

sors, presided over by a rector elected yearly, or (at Halle and Tübingen) by a chancellor appointed for life, the exercise of discipline being, however, intrusted to a separate court, presided over by a judicial officer called the syndic. There is a recognized gradation in the professorial office. The highest class are *ordinary professors*, generally men of considerable eminence in their respective departments, elected by government out of three candidates submitted by the faculty to which they belong. Next to them are the *extraordinary professors* of the same branches, with smaller salaries; and then the class of *privat-docents*, who, in the course of time, qualify themselves to be extraordinary professors. An ordinary professor must deliver public lectures on the branch to which he is appointed; an extraordinary professor, or *privat-docent*, may lecture on what subject he pleases. The student is for the most part at liberty to attend what lectures he pleases; but licenses to practice certain professions, benefices in the church, and other posts, are only given to persons who have gone through a certain course of university study. In addition to the above-mentioned classes of instruction, there are attached to the university teachers of modern languages and other branches not forming part of the curriculum. The *bursæ*, foundations resembling in their origin the English colleges, and the *convict*, or free table, are institutions for the benefit of the poorer students, from the former of which is derived the name *bursche*, popularly applied to a student in Germany. The German university system is admirably adapted to promote the advancement of science; its deficiency is chiefly in appliances for superintending the progress of the individual student. The professor is often more an instructor of the world at large by his writings, than of his students by his lectures.

The two great English universities are little inferior in antiquity to Paris and Bologna. From the beginning of the 12th to the middle of the 14th c., Oxford played nearly as important a part in the advancement of science and political life as Paris itself, with which it was connected by intimate ties, the most eminent doctors of Oxford acting at the same time as regent-masters in Paris. It espoused the cause of the barons against the crown, and while preserving an intimate relation with the church, generally sided against ecclesiastical abuses. Oxford and Cambridge, not unlike the continental universities in their origin, developed themselves in a manner peculiar to England. From an early period it was the practice of the students to live in common in halls or hostels, rented from the burghers, under the charge of a common teacher. In 1280 there were no fewer than 34 halls at Cambridge, some containing as many as 20 to 40 masters of arts, and a proportionate number of younger students. In the course of time, colleges were endowed by benevolent persons for the maintenance of the poorer students, and the name *socii*, or *fellows*, was applied to the recipients of the endowments. This assistance was originally meant to last no longer than the completion of the course of study; but as most of the *socii* belonged to the ecclesiastical order, and had no other means of support, an understanding gradually arose that the aid furnished by the college should be continued to the *socius* till he succeeded in obtaining a benefice. These provisions gradually increased in number and importance; and a practice was introduced of the colleges receiving wealthier students as boarders—the origin of the class of commoners or students not on the foundation. Most of the halls fell into decay, and those that remained received a collegiate character. In the 15th c., fellowships were no longer endowed to assist students going through their course of study, but as a permanent provision for poor young men of the clerical order who showed a taste for learned pursuits, and the degree of master was made a necessary condition for holding them. In this way the colleges became the university; the university acquired a semi-monastic character, which has since more or less adhered to it; and a tutorial system of education within the colleges was almost entirely substituted for instructions by university professors. For two centuries, the staff of professors have had little to do with academical education or discipline. The instruction of the student is committed to college tutors, assisted by private tutors, and attendance on the professors is in general neither required for university rank nor for college emoluments. The tutorial system is defended on the ground of its giving the instructor a greater hold over the student's attention. On the other hand, it lacks the advantages arising out of the division of labor in the professorial system; and it is now generally allowed that a mixture of both systems of teaching is better than either alone. An effort has been made by the new statutes to render the professorial office in Oxford and Cambridge rather less of a sinecure than formerly. One of the most remarkable features of the English universities is their wealth in endowments. According to the *Universities Commission Report* (1874), the annual revenue of Oxford and Cambridge amounts to about £750,000, of which endowments provide £614,000. For the mode of government, see CAMBRIDGE; OXFORD.

Of the two modern English universities, London university (q.v.) was established by royal charter in 1836. Durham university was opened for students in 1833, and obtained the right of conferring degrees by royal charter in 1837. The general provisions for education are similar to those of Oxford and Cambridge, and there is also a course of theological study. In 1837, a course of instruction was added in mining and civil engineering. The university of Dublin (q.v.), founded in 1591, consists of a single college, named Trinity, with a constitution similar to the colleges of Oxford and Cambridge; but the professorial element is to a large extent united with the tutorial.

The universities of Oxford and Cambridge have since 1603 returned two members

each to parliament; the university of Dublin has the same privilege; while London university elects one.

The universities of Scotland, mostly founded in the 15th c., approached much more nearly to the type of Germany and the Low Countries than of England. The teaching as well as governing body were the professors; and the college was a building for the accommodation not of the students or fellows, but of the professors, as public lecturers. Though nearly all the students were Scotchmen, they were nevertheless divided, according to continental usage, into four nations, named from the parts of Scotland to which they belonged. In St. Andrews, there were from the first the separate faculties of divinity, arts, and canon law. A *pædagogium* was erected in 1430 for the faculty of arts. In 1450, Kennedy, bishop of St. Andrews, established and endowed the college of St. Salvator, to which pope Paul II. accorded the privilege of conferring degrees in theology and the arts, constituting it to that effect a separate university. St. Leonard's college was founded in 1512, and St. Mary's in 1537, with power of conferring degrees. After the reformation, St. Mary's was restricted to the study of theology; and in 1747, St. Salvator and St. Leonard were united. Glasgow had its lecturers in canon and civil law, and theology, from the beginning. The faculty of arts, however, alone received a definite shape and constitution; it had, as at St. Andrews, a *pædagogium*; and prior to the reformation, had nearly absorbed the university. During the reformation period, Glasgow university was nearly annihilated; but it was restored by the exertions of queen Mary and James VI. "The university of Aberdeen, as now constituted, derives its origin from two different foundations—one, the university and King's college of Aberdeen, founded in 1494 by William Elphinstone, bishop of Aberdeen, under the authority of a papal bull obtained at the instance of king James IV.; the other, Marischal college and university of Aberdeen, founded in 1593 by George Keith, earl Marischal, by a charter ratified by act of parliament" (*Aberdeen University Calendar*). By the universities (Scotland) act, 1858, King's and Marischal college have been incorporated into one university and college, as the university of Aberdeen—King's college being reserved for the faculties of arts and divinity, and Marischal college for law and medicine. The university of Edinburgh, founded after the reformation, had but little of the ancient university character, being a professorial seminary on a royal foundation, rather than a society of graduates or students. James VI.'s charter of foundation placed it in the hands of the magistrates of the city, who remained its patrons till 1858. Besides a large number of small bursaries, there are now a few more considerable scholarships at the Scotch universities; but the endowments of this kind are still inconsiderable compared with those of the universities of England.

The Scotch universities have been much modified in various respects by a statute passed in 1858. For some time previous, there had been a growing conviction that they were not keeping pace with the intelligence of the country. The absence of sufficient preparation on the part of the students obliged the professors of languages and mathematics to discharge inefficiently the functions of school-masters rather than their proper duties. Scholarship had declined, and a Scottish degree in arts had fallen into disrepute. These evils were sought to be cured by establishing an entrance examination, by grafting a certain amount of the tutorial on the professorial element, and by raising the standard of examination for degrees, so as to make them objects of ambition. The act of 1858 placed the Scottish universities under the superintendence of a board of commissioners for the space of four years, who had power to carry the statutory provisions into effect. A uniform constitution was given to all the universities, each of which has now three governing bodies, the *senatus academicus*, the university court, and the general council; the chief officers being the chancellor, the vice-chancellor, and the rector. The *senatus academicus*, composed of the principal and professors, superintends the teaching and discipline, and administers the property and revenues of the university, one-third being a quorum, and the deliberations being subject to the control of the university court. The principal presides, and has both a deliberative and a casting vote. The *university court* consists of the rector, the principal, and assessors named by the chancellor, rector, general council, and *senatus academicus* (in Edinburgh, the lord provost and an assessor elected by the town-council, are also members of the court). The rector is president, with a deliberative as well as a casting vote. The rector, and the assessor nominated by him, continue in office for 3 years; the other assessors for 4 years. The functions of this body include the reviewing of the decisions of the *senatus*, the regulation of the internal arrangements of the university, in conjunction with the *senatus*, the chancellor, and the university court; and the exercise of patronage to the chairs whose patronage was formerly in the *senatus*. The *general council* consists of the chancellor, the members of the university court, the professors, masters of arts, doctors of medicine who have attended four sessions, and all persons who, prior to Aug., 1861, produced evidence of attendance for four complete sessions, two of them being in the faculty of arts. The council meets twice a year, the chancellor, whom failing, the rector or principal, or senior professor present presiding, with a deliberative and casting vote. The duties of the council are not legislative, but only deliberative; it may entertain any question affecting the university, and make representations regarding them to the university court. The chancellor is elected by the general council, and holds office for life; he appoints a vice-chancellor, who may act for him in confer-

ring degrees, which is his principal function. The rector is elected by the matriculated students, and holds office for 3 years. At Edinburgh the patronage of those chairs which were in the gift of the town-council has been transferred to seven curators, three of them nominated by the university court, and four by the town-council. Entrance examinations have been instituted in all the universities, and assistants appointed to several of the professors, with functions somewhat analogous to those of tutors in England. The degrees now conferred in the Scotch universities are master of arts, bachelor of divinity, bachelor of laws, bachelor of medicine, master in surgery, and doctor of medicine; besides doctor of divinity and doctor of laws, which are purely honorary. Edinburgh grants, in addition, the degrees of bachelor of science and doctor of science, and Glasgow that of bachelor of science. The degree of bachelor of arts is not now given in any of the universities of Scotland.

The universities of Edinburgh and St. Andrews, and the universities of Glasgow and Aberdeen, form two constituencies, each represented by one member of parliament.

See Savigny, *Geschichte des Römischen Rechts im Mittelalter*; Bulæus, *Historia Universitatis Parisiensis*; Crevier, *Histoire de l'Université de Paris*; Malden, *History of Universities and Academic Degrees*; Kirkpatrick, *Historically Received Conception of a University*; Huber, *History of English Universities*; Wood, *History and Antiquities of Oxford*; Dyer, *History of the University of Cambridge*; Reports of Royal Commissions concerning the Universities of Scotland; Report of Commissioners on Oxford and Cambridge Universities.

UNIVERSITY COLLEGE, the oldest college in the university of Oxford, is said to have been founded as early as 872 by Alfred the great. It was restored by William of Durham, rector of Wearmouth, who, at his death in 1249, left a sum of money to form a permanent endowment for a certain number of "masters," preference being given to those who were born nearest the city of Durham. Among the subsequent benefactors are found king Henry IV., who founded (1403) 3 fellowships, at the request of bishop Skirlaw of Durham (who consequently is also ranked as a "benefactor"); Henry Percy, earl of Northumberland, who founded (1442) 3 fellowships; sir Simon Bennet, bart., who founded (1631) 4 fellowships and 4 scholarships; etc. In 1714 Dr. John Radcliffe attached to this college 2 fellowships, tenable for 10 years by masters of arts, who must travel abroad during 5 years. The present foundation consists of 1 master, 13 fellows, 12 scholars, and several exhibitioners. The patronage consists of 10 livings.

UNIVERSITY OF FRANCE. In France, since the revolution, the word university has acquired a meaning widely different from that which it bears in other countries; the expression "université de France" being nearly equivalent to "national system of education of France." All the old universities of the country having been swept away at the revolution, education had fallen into abeyance. After various attempts at the establishment of primary, secondary, and central schools in the departments, the imperial government adopted a new system, by which the whole educational machinery of the country was centralized at Paris, and committed to a body called the university, with a grand-master at its head, assisted by a council. The system has since undergone various alterations. The governing body, as well for the higher educational institutes as for the elementary schools, is the ministry of public instruction supported by a supreme educational council and 18 inspectors-general. France is divided into 16 educational districts, the so-called *académies*, within the bounds of which exist one or more of the *faculties* of theology, law, medicine, and science and literature. Such faculties are found in 18 towns besides Paris; but only in the latter are the five co-existing faculties organized into a university. The monopoly, hitherto enjoyed by the university of France, of opening schools of law and medicine, and of conferring degrees, was abolished by a law passed in 1875.

UNKIAR-SKELESSI, a small t. on the Atlantic shore of the Bosphorus, in the neighborhood of Scutari, gives its name to a treaty concluded between Turkey and Russia, July 8, 1833. This treaty, which consisted of six articles, was one of mutual defensive alliance; but a separate and secret article was subjoined, by which the sultan, in place of the military or naval aid which, by the first article of the treaty, he was bound to furnish to Russia, agreed to close the strait of the Dardanelles, allowing no foreign vessels of war to enter it under any pretext whatever. In consequence of this treaty, Russia landed 15,000 men at Scutari, and stopped the victorious career of Ibrahim Pasha (q. v.). The secret article was soon after divulged to Britain and France, both of whom regarded the treaty with dislike; and by the terms of that concluded at London, July 13, 1841, the stipulations of Unkiar-skelessi were annulled.

UNLEAVENED BREAD, USE OF, in the Eucharist, has long been a subject of controversy between the Latin church on the one hand and the Greek and other oriental churches on the other; with the latter of whom the reformed churches in later times have conformed in their practice of celebrating the Lord's supper. The early history of the usage is very obscure; but the western church had certainly, from a very remote date, employed *azyma*, or unleavened bread, in the consecration and distribution of the Eucharist; nor was this usage made a subject of controversy with the Latins by Photius, on occasion of the dispute between the churches, which arose during his patriarchate. In the later controversy, however, under Michael Cerularius (see GREEK CHURCH), the

question of azymis became very prominent, and the diversity of practice still continues a subject of controversy between the Greeks and Latins. The principal argument alleged by the advocates of the use of leavened bread, is founded on the assumption that the last supper of our Lord took place on the eve of the Passover, that is, on the 13th day of the month Nisan, on which day common bread, and not the azymis, must have been used; and on this and some other grounds, some writers, even among the Roman Catholics themselves, and especially the learned Jesuit Sirmoud, have maintained that the last supper was actually celebrated in leavened bread. On the other hand, however, it is contended that the last supper, being held in the evening of that day, was, in the strictest sense, our Lord's celebration of the Passover, and therefore (Exodus, xii. 8-20), that the bread can have been no other than azym, or unleavened. It must be added that all Roman Catholic writers, and the more learned among the Greeks, are agreed that the Eucharist may be *validly* consecrated whether the bread be leavened or unleavened.

UNNA, a small t. of Prussia, in Westphalia. 19 m. n.w. of Armsberg. It was formerly fortified, was one of the Hanse towns, and played a rôle in the history of the Femgerichte (q.v.). About a m. to the n. are the famous salt-works of Königsborn, which yield 120,000 cwt. of salt annually. Pop. (1875) 7,330, who are employed in weaving linen and hosiery, and in brewing and distilling.

UNST, the most northern of the Shetland islands, in lat. 60° 45' n., is 12 m. long, and 3½ m. in average breadth; area, 36 sq. m.; pop. (1871) 2,768. The coast is much broken, and the headlands are rocky, mural, and lofty. There are 2,000 acres under cultivation, and about as many in pasture. Valuable minerals abound, and chromate of iron is an article of commerce. The island contains numerous tumuli, a chain of Scandinavian dunes, and the ruins of upward of 20 ancient chapels. Fishing and agriculture are the chief employments.

UNTERWALDEN, one of the four Waldstätten, or forest cantons of Switzerland, forms part of the hill country which surrounds the lake of Lucerne (see SWITZERLAND). It is 25 m. in length by 21 m. in breadth, and has an area of 297 sq. miles. In 1870 the pop. was 26,116; in 1877 it was 27,159. Unterwalden is bounded on the e., s., and w. by lofty hills, and subsidiary ridges divide it into two parallel valleys—both of which open on the n. into the lake of Lucerne. The eastern valley is drained by the Engelberger Aa, the western valley by the Sarner Aa. Great highways run up these valleys from the shores of the lake, and in several places communicate with each other; but they do not connect Unterwalden with surrounding cantons. The canton is chiefly pastoral. Some attempts have been made to cultivate the vine, but they have not proved successful. The language of the people is a Swiss-German dialect; their religion is Roman Catholic. Unterwalden is divided into two parts; not, however, corresponding with the two river basins of which it is formed. The forest of Kerns, or Kernwald, formed the line of separation between these two districts, which were separate so early as 1150. One is named the Obwald, or district above the forest, and includes the whole of the western valley. The other is the Nidwald, which includes only the lower part of the eastern valley. Each division forms an independent republic, with its own administration. Both have a *landesgemeinde*, or parliament, composed of all the inhabitants 20 years of age, with the exception of a few *heimathlosen* (tramps); and each forms a half-canton, that is, a canton which returns one member to the Swiss council of state. The *landesgemeinde* of each half-canton assembles in the open air late in the spring, when it passes new laws, pays off accounts, imposes taxes, and appoints the executive officers. The capital of the Nidwald is Stanz (pop. in 1870, 2,070), remarkable for its fine church and statue of Winkelried. The capital of the Obwald is Sarnen, with a population of (1870) 3,720.

UPANISHAD is the name of those Sanskrit works belonging to the Vedic literature which contain the mystical doctrine of the Hindus on the nature of a supreme being, its relation to the human soul, and the process of creation (see INDIA, sec. *Religion*). The word (derived from the Sanskrit prefixes *upa*, "beneath," or "near," and *ni*, "in," combined with the radical *śad*, "sit") is explained by the great theologian, *S'ankara* (q.v.), and others after him, as meaning the "science of Brahman," or "the understanding of the identity of Brahman and the soul," because "in those devoted to it, this science sets to rest (or destroys) the world, together with (ignorance) its cause; or, in other words, because it shows to them that the world has, besides Brahman, no reality; Grammatical commentators explain its etymology as implying that "eternal bliss *reposes on it* (*upanishādīti s'reyo 'syām*)," and prof. M. Müller has surmised that the word "Upanishad meant originally the act of sitting down near a teacher, of submissively listening to him," whence it came to mean "implicit faith, and at last truth or divine revelation." But apart from the artificialness of all these interpretations, it deserves notice that the earliest sense of the word appears to be that of "secret" or "mystery" (literally, "that which sits or rests beneath"). In this sense, it is mentioned by the grammarians Pāṇini; and as it is very probable that, in his time, the works bearing the name of Upanishads were not yet in existence (see Goldstücker's *Pāṇini*, etc., p. 141), it may be assumed that these works derived their name from the mysteriousness of the doctrine contained in them; and perhaps also from the mystical manner in which they propounded it.

In order to understand the origin and purport of the Upanishads, as well as the relation in which they stand to the Vedas, properly so called, it must be borne in mind that, though the Vedic hymns are based on the worship of the elementary powers, and the Brāhman'a portion connected with them is chiefly concerned in legendary and ritual matter relating to that worship, yet in both these portions of the Vedas, and especially in the Brāhman'as, the beginnings of a period become already visible when the poets raised the questions as to the origin of the world and the true nature of the gods. See INDIA, sec. *Religion*. A first attempt at a systematic answer to these questions was made in works which bear an intimate relation to the Brāhman'as; and so great was the awe in which, on this account, these works were held, that they had to be read in the solitude, where the mind could ponder in perfect calmness over the mysterious problems in which they are engaged. These are the *Aran'yakas* (from *aran'ya*, a forest.) But as the style and contents of the Aran'yakas are extremely obscure, and as, through the close alliance of these works to the Brāhman'as, of which some of them form part, the theological questions of which they treat are much overlaid with ritual and other matters which properly belong to the Brāhman'as, a further progress made in the same direction, led to the composition of works and treatises, the diction of which is somewhat clearer and less entangled with subjects extraneous to the problems they intend to solve. Such works and treatises are the *Upanishads*. Their object, like that of the Aran'yakas, is to impress the mind with the belief in one supreme spirit (*Brahman*, as a neuter, and different, therefore, from the same word as a masculine, which is the name of the first god of the *Trimūrti*, q.v.), to show that this supreme spirit is the creator of the world; that the world has no reality if thought of besides Brahman, and that the human soul is identical in nature with that same spirit whence it emanates. The reward the Upanishads hold out to the believer, who understands their doctrine, and firmly adheres to it, is freedom from transmigration (q.v.), and consequent eternal bliss. The object and aim of the Upanishads are therefore the same as those propounded in the philosophical systems (see SANSKRIT, sec. *Literature*); and the Upanishads may therefore be looked upon as the forerunners of these systems themselves—those Upanishads, at least, which we may call the older Upanishads; for as to the more recent ones, and those which bear the stamp of a sectarian character, their claim to be ranked among the Vedic writings is extremely doubtful, if at all admissible.

Though agreeing in the main points of their doctrine, it is easily understood that works of this nature, ranging over different periods of Hindu religion, will also differ from one another both in the manner and detail in which they deliver their subject-matter, and in the degree of completeness with which they treat of it. Thus, in some, the legendary narrative, and even ritual detail, are still considerably blended with the theological speculation—and these stand nearest, therefore, the Aran'yakas, probably also in time: in others, more philosophical, the nature of Brahman and the human soul is the only subject of inquiry, in others, the process of creation is also enlarged upon, with detail which harmonizes more or less either with the ulterior views of the Vedānta (q.v.) or those of the Sa'nkhya (q.v.) philosophy; some Upanishads, again, especially emphasize the inefficiency, for the attainment of eternal bliss, of the performing religious acts and of worldly studies—the knowledge of Brahman being the only means that leads to this end; others, on the contrary, in conformity with the Yoga (q.v.) doctrine, assign a prominent place to the exterior means, by using which the soul would qualify itself for union with the supreme spirit: while the sectarian Upanishads, which identify this spirit with Vishnu and Śiva, have, besides, the tendency of reconciling the popular with the philosophical creed.

Of the older Upanishads, a typical instance is furnished in the Chhândogya Upanishad of the Sāmaveda, the framework of which is legendary throughout, and its contents allegorical and mystical. Other shorter Upanishads, freer from narratives and allusions to the mysterious import of ritual acts, aim at a more intelligible exposition of the doctrine of the soul. Of their mode of treatment, the following passage from the *Kāṭhaka* Upanishads will serve as an example; *Nachiketas*, the son of Vājaśravas, having come to the abode of Yama, the judge of the dead, and obtained from him the grant of three boons, asks of him, for his third boon, an answer to the following question; "There is this doubt: some say that (the soul) exists after the death of a man (in connection with another body than this); others say that it does not. This I should like to know, instructed by thee." And Yama, after some hesitation, explains to him that the soul and Brahman are one, but that a man attains immortality only by understanding this unity, and that, to arrive at this understanding, he must free his mind from sensual desires, and get a correct knowledge both of the nature of Brahman and of the soul. "Know the soul as the rider, and the body as the car; know intellect as the charioteer, and *manas* (the organ of volition) as the rein. The senses, they say, are the horses, the objects (their) roads; and the enjoyer (i.e., the rider) is (the soul) endowed with body, senses, and *manas*. Thus say the wise. If he (the charioteer) is unwise, and his *manas* is always unbridled, his senses are uncontrolled like vicious horses; but if he is wise, and his *manas* is always bridled, his senses are controlled like good horses. He who, always impure, is unwise, and whose *manas* is unbridled, does not attain that abode (of immortality), but comes to the world (of birth and death), he, however, who, always pure, is wise, and whose *manas* is bridled, he attains that abode whence he is not born

again. The man who has a wise charioteer, and whose manas is bridled, reaches the other shore of the road (of the world), the highest abode of Vishnu. Higher (i.e., subtler), indeed, than the objects are the senses; higher than the senses is manas; higher than manas, intellect; and higher than intellect, the great one, the soul. Higher than the great one is that which is unmanifested, and higher than the unmanifested is Purusha, the supreme spirit. But higher than Purusha there is nothing; he is the goal, the highest resort. This highest spirit is the soul hidden in all created beings; it is not manifest, but is beheld by those who can see what is subtle with an attentive, subtle intellect." The coincidence between the allegory, in the foregoing passage, and that in Plato's *Phaedrus*, imparts an additional interest to this Upanishad, which is valuable, moreover, on account of the evidence it affords as to points of agreement and difference between its views of the development of the world and those expounded in the Sāṅkhya (q.v.). The *Mundaka* Upanishad is important for the relative position which it assigns to the teaching of the Vedas, and the doctrine of the Upanishads. "Two sciences," it says, the knowers of Brahman tell us, "must be known, the higher and the inferior. The inferior is (the knowledge of) the R̥gveda, the Yajurveda, the Sāmaveda, and the Atharvaveda, the knowledge of pronunciation, the ritual, grammar, explanation of Vedic texts, prosody, and astronomy. But the higher knowledge is that by which that imperishable Brahman is comprehended. That which is invisible, unseizable, without descent (or origin), without either color, eye, or ear, without hand or foot, eternal, manifold (in creation), all-pervading, very subtle, undecaying—the wise behold it as the cause of created beings." And in another place the performers of the sacrificial rites ordained by the Veda are said to attain, indeed to Indra's heaven in virtue of their pious work; but this state of bliss is declared to be unstable and perishable, and these "fools . . . drop (from their heaven) as soon as this heaven (the reward of their acts) has faded away. Fancying that pious acts, ordained by the Vedas and codes of law, are the highest (object of man), these ignorant people do not know that there is something else which leads to eternal bliss. Having enjoyed (the reward of their deeds) on the happy summit of paradise, they enter again this world, or one that is (even) lower. Those, on the contrary, who practice penance and faith, and, with subdued desire, live in the forest, under the vow of a religious mendicant, they, free from sin, enter through the sun to that abode where resides that immortal spirit, that spirit, indeed, of undecaying nature."

The *Taittirīya*, or *Kena*, Upanishad, which, being one of the shortest, is in form one of the most philosophical treatises of this kind, puts in clearer language, perhaps, than any other Upanishad, the doctrine that the true knowledge of the supreme spirit consists in the consciousness which man acquires of his incapacity to understand it, since the human mind being capable only to comprehend finite objects, cannot have a knowledge of what is infinite.

The Upanishads are not supposed to have been revealed in the same manner as the Vedic hymns. See VEDA. Nevertheless, with the exception of a few confessedly modern Upanishads, they are not assigned to human authorship, but looked upon as inspired writings, to which the term *Śruti* (q.v.) applies. In several Upanishads, no special mention is made of their divine origin; in some, however, this is done. Thus *Chhândogya* Upanishad, in its concluding section, relates: "This (knowledge of the soul) Brahman (the god of the Trimūrti) imparted to Prajāpati (a lord of creation—the patriarch Kaśyapa, as Sāṅkara explains); Prajāpati imparted it to Manu, and Manu to mankind; the *Bṛhadāraṇyaka* Upanishad which on three occasions gives long lists of teachers who handed it down to their pupils, always ascribes itself, in the last instance, to the authorship of "the self-existent Brahman (the supreme spirit); and in a similar manner the *Mundaka* Upanishad says that it was Brahman (the god of the Trimūrti), the creator of the universe, who first taught the science of the supreme spirit to his eldest son, Atharvan. As in the case of most ancient works of Sanskrit literature, the date of the Upanishads also still remains quite uncertain, and, wherever given, is purely conjectural. According to the native system, they are classified as belonging to one or the other of the four Vedas, with which they are held to stand in immediate connection. There are Upanishads, consequently, of the R̥g-, Yajur-, Sāma-, and Atharvaveda. But this classification has no reference whatever to chronology. For a fuller account of these works, see prof. Weber's *Indische Studien*, vols. i. ii. (Berlin, 1850-53), and his *Akademische Vorlesungen über Indische Literatur-geschichte* (Berlin 1852); prof. M. Müller's *History of Ancient Sanskrit Literature* (Lond. 1860); John Muir's *Original Sanskrit Texts*, vol. i.-iv. (Lond. 1858-63); and the edition and translation of several of these Upanishads by E. Roer, *Rājendra Lāla Mitra*, and E. B. Cowell, in the *Bibliotheca Indica*; also Raja Rammohun Roy's *Translation of several Principal Books, Passages, and Texts of the Veds* (Lond. 1832). The names of 149 Upanishads, as compiled from various sources by prof. M. Müller, may be found in the *Zeitschrift der Deutschen Morgenländischen Gesellschaft*, vol. xix. p. 137, ff.

UPAPURAN'A. See PURAN'A.

UPAS (the Malay word for *poison*) is the name given to a number of vegetable poisons in the Eastern archipelago and the Philippine islands. The most celebrated poison of this kind is produced by the *antjar* (*antiaris toxicaria*), a tree which grows in the Sunda and Philippine islands. It attains a height of upward of 100 ft., and belongs

to the natural order **ARTOCARPACEÆ** (q.v.), the same order with the bread-fruit. The leaves are lanceolate. The female flowers are solitary; the male flowers congregated beneath them in numbers upon the receptacle, which has a long stalk, and is of the shape of a watch-glass. The fruit is a kind of drupe, covered with fleshy scales. From the milky juice of this tree (called in some of the islands *polou-upas antjar* in Java and *ipo* in the Philippines), mixed with black pepper, and the juice of galanga root and of ginger, the Malays prepare a poison for their arrows, which proves speedily fatal to men and to the larger mammalia. The only hope of relief is by means of severe vomitings and the excitement of profuse perspiration. Although the fresh juice of this tree, brought into contact with the skin, acts as a poison, the story of a poison-vale in Java, in which the exhalations of numerous poison trees extinguish all animal life, and even all other vegetable life, is a mere fable. There is a narrow valley in Java where neither animal nor vegetable life can subsist, but this is owing to carbonic acid gas emitted from the ground, as in the *Grotto del Cane*, near Naples, and the upas-tree is as incapable of living there as any other. It is found in forests, and does no harm to the other trees around it. The prepared upas or antjar poison is kept in close tubes of bamboo, and is of the consistence of molasses. The flesh of animals killed by this poison may be eaten with perfect safety; although the virulence of the poison is shown by its extremely rapid action. It is not perfectly known what the substance is which gives to the juice of the upas tree its poisonous properties, but it appears to be an alkaloid. The fiber of the bark of the upas tree is sometimes made into cloth, but unless the fiber is thoroughly cleaned, garments made of it produce a painful itching. A still more powerful poison than the upas antjar, employed in the same part of the world, is the *upas tjetek* or *upas tieute*, which is prepared in a similar manner from the root of the *strychnos tieute* (see **STRYCHNOS**). It abounds in strychnine.

UPHAM, CHARLES WENTWORTH, 1802-75; b. St. John, N. B.; graduated at Harvard college, 1821, and at the divinity school, 1824; ordained colleague pastor with rev. John Prince of the First Unitarian church, Salem, Mass.; relinquished the ministry on account of loss of voice in 1844. He edited the *Christian Review* and *Christian Register*; was mayor of Salem, 1852; several times member of the legislature; president of state senate, 1857-58; member of congress, 1853-55. He published *Letters on the Logos; Lectures on Witchcraft; Life of Sir H. Vane; Life of J. C. Fremont; Prophecy as an Evidence of Christianity*.

UPHAM, THOMAS COGSWELL, D.D., 1799-1872; b. N. H.; graduated Dartmouth college, 1818; Andover theological seminary, 1821; assistant teacher of Hebrew; colleague pastor of the Congregational church, Rochester, N. H., 1823-24; professor of mental and moral philosophy, and instructor in Hebrew, Bowdoin college, 1825-67. He published, *Elements of Mental Philosophy; Treatise on the Will; Principles of Interior or Hidden Life; Ratio Discipline; Treatise on Divine Union; The Life of Faith*. His writings are deeply spiritual, and though their philosophy tends to mysticism, are quickening and suggestive.

UPHEAVAL or **UPTHROW** of **STRATA**, the change in stratified rocks from their original horizontal position to one more or less inclined, produced by an expansive subterranean force, or other power, like the pushing forward of the crust itself, as in the case of the Appalachian mountains (q.v.). In slight changes of level, the continuity of the rock is unbroken; but frequently immense cracks are formed, into which igneous rocks penetrate, and form a backbone for the upraised mass, or dikes penetrating the strata. Upheavals may take place slowly, like the present gradual change in the Scandinavian coast, or may be more rapid when produced by some sudden earthquake.

UPHOLSTERY, that branch of trade which relates to the furnishing of a house with curtains and other kinds of hangings. It is also applied more generally, and is made to include bedding, carpeting, and the covering of chairs, couches, etc.

UPOLU, one of the richest and most beautiful of the islands of the Pacific, belongs to the Samoan group, lying about 60 m. w. of Tutuila. It is 140 m. in circumference, and has 16,000 inhabitants. The island has been a mission station for many years, and the English consul was till 1875 the son of Mr. John Williams, the missionary, whose melancholy fate is well known. Many of the inhabitants are Christians. The chief harbor is Apia, a civilized-looking place, with many edifices on the European model. Many of the natives are turning their attention to the cultivation of cotton, and the cotton-seed grows wherever it is cast on the ground; the only trouble experienced in raising cotton is the clearing and keeping down the weeds. On an average, about 200 acres annually are under this crop. Coffee is also cultivated. The principal article of export, however, is cocoa-nut oil. Upolu affords a plentiful supply of fruits and vegetables, and is visited annually by numerous English and American whalers.

UPPER SANDUSKY, a city in Ohio, co. seat of Wyandot co.; pop., '70, 2,564. It is pleasantly situated on the w. bank of Sandusky river, 64 m. n.w. of Columbus, and 60 m. s. of Toledo, at the junction of the Pittsburg, Port Wayne and Chicago, and the Columbus and Toledo railroads. It contains many fine residences, 8 churches, public schools, 3 banks (1 national), and 2 newspapers. It has foundries, machine-shops, and carriage factories.

UPSALA or **UPSAL**, a district or län in Svealand, Sweden, situated on the gulf of Bothnia, 2,015 sq.m.; pop. '74, 102,629. The surface is rugged and barren in the n. but has a fertile soil elsewhere; cattle are largely exported. Iron ore is found in large quantities. The best mines are those of Dannemora. Capital, Upsal.

UPSAL', an ancient and beautiful t. of Sweden, on the Fyrisä, a navigable stream 45 m. n.n.w. of Stockholm. The eastern part of the town stands on a wide and fertile plain; the w. part, containing the chief buildings, occupies a high range of ground looking over an apparently boundless plain to the n. and east. Upsala is the seat of an archbishop, who is the primate of the whole country. The great attraction is the cathedral, once a beautiful structure, and handsome still, though disfigured by restorations. It is in the Gothic style, built of brick, was founded in 1258, and completed 1435; is 330 ft. long by 140 broad, and 105 ft. high, and contains the tombs of Linnæus, and of Gustavus Vasa and several other Swedish kings. The university of Upsala—the chief institution of the kind in the country—founded in 1477, is attended by about 1400 students, taught by 30 professors and 70 other teachers. The library contains 160,000 vols. and 8,000 MSS., several of which are very valuable. Pop. '75, 12,644, the mass of whom are dependent upon the university for their livelihood.—Two miles n. of the town is Old Upsala, now a village, which during the heathen period was the seat of the Odin worship, with a splendid temple and sacred grove, which have now disappeared. Also about 4 m. from Upsala are the famous Mora-stones, where in the middle ages the election and crowning of the Swedish kings took place.

UP-SAR-O-CA, or **ABSAROKA**. See **CROW INDIANS**.

UPSHUR, a co. in n.e. Texas; 945 sq.m.; pop. '80, 10,266—10,222 of American birth, 3,382 colored. Co. seat, Gilmer.

UPSHUR, a co. in central West Virginia, containing the head-waters of the Monongahela river; 320 sq.m.; pop. '80, 10,249—10,122 of American birth, 201 colored. Co. seat, Buckhannon.

UPSON, a co. in central Georgia, having the Flint river for its s. boundary; 300 sq.m.; pop. '80, 12,400—12,397 of American birth, 6,267 colored. Co. seat, Thomaston.

UPTON, **EMORY**, b. N. Y., 1839; graduated at West Point, 1861. In the war of the rebellion he served as aid to gen. Tyler, was wounded at Bull Run, and took part in the battles of South Mountain, Antietam, Fredericksburg, Chancellorsville, and Gettysburg. At Spottsylvania he was again wounded, but was present at the battle of Cold Harbor, the siege of Petersburg, the Shenandoah campaign, and elsewhere. He was promoted through the various grades, and at the end of the war had the brevet rank of maj.gen. His treatise on *Infantry Tactics* was adopted in 1867.

URACHUS, **TIRE**, in the adult human subject, is a small fibrous cord formed by the obliteration of a tubular canal, which in the embryo runs from the apex of the bladder to the umbilical cord. In other mammals it remains open, and is continuous with one of the fetal membranes; and it has been found pervious in the human subject at birth.

URAL, a river of Russia, called *Rimna* by the ancients, later, *Jaik*, and since 1775 by its present name, rises in the southern section of the Ural mountains, near the e. frontier of the government of Orenburg. It flows s. through the district of Troitzk, past the town of Virchni-Uralsk, to its confluence with the Kasil; and in this region its course is over hilly meadows, and its current is very rapid, owing to its narrow and uneven bed. At the town of Orsk the river bends westward, and runs in that direction as far as the mouth of the river Tchagan, after which it flows directly s., and falls into the Caspian sea. It is deep enough for navigation; but owing to the scarcity of wood for ship-building, and the number of sandbanks that bar the river, no navigation can be carried on. This loss, however, is compensated by the fisheries of the river, which abounds in the most highly esteemed varieties of fish, and yields to the Cossacks settled along its banks an annual revenue of 600,000 rubles (£93,750). The Ural has long served as the frontier separating Russia from the Kirghis steppes, and many forts have been erected, and a settlement of Cossacks—known as the Ural Cossacks—established along the river. The direct length of the Ural is estimated at 550 m., with windings, 1040 miles. The principal affluents are the Kasil and Sakmara, on the right, and the Ore and Ilek on the left.

URAL MOUNTAINS (probably the Tartar word *ural*, belt), the *Hyperborean mountains*, or *Rhipæi montes*, of the ancients, form part of the boundary between Europe and Asia, and separate European Russia on the w. from Siberia on the east. The chain extends s. from the Kara sea, an arm of the Arctic ocean, to the middle course of the Ural river, or from lat. 70° to that of 50° n., and is 1333 m. in length, with a breadth varying from 16 to 66 miles. Although the Ural mountains form really a single uninterrupted chain, geographers have agreed to consider them as divided into three sections—the northern, middle, and southern Ural. The northern Ural separates the basins of the rivers Petchora and Ob, is for the most part rocky, does not rise higher than 3,000 ft.,

and is commonly called *Poustoi* (empty), because it is extremely poor in ore. The middle Ural, commonly called *Roudnoi* (metalliferous), the principal seat of the mineral riches of the whole chain, comprises the highest peaks, as the Kanjakovski Kamen, rising to 5,000 ft.; but in some places the height is so insignificant, and the slope so gentle, that travelers can scarcely distinguish it from the lowlands. The southern Ural divides itself into three branches, two of which extend to the e. of the Ural river, and gradually disappear in the Uralo-Caspian deserts, while the third branch extends along the right—the western—bank of the Ural. The chain is composed chiefly of crystalline and metamorphic rocks, granite, gneiss, porphyry, chloritic, and micaceous schists. The Ural mountains, especially the middle and the n. part of the southern Ural (the governments of Perm and Orenburg), abound in mines of gold, platinum, copper, and iron. These mines, or *zavods*, are partly the property of the state, partly that of private individuals. Of the latter, the chief are the Nijni-Tagilsk, belonging to the Demidoff family; the Verchisetsk and Neviansk, belonging to the Takosleff family. The gold diggings occur on both slopes of the mountains, and gold is sometimes found in nuggets of considerable weight—the heaviest ever found in the chain being about 80 English lbs. in weight. In 1862 the amount of gold extracted from the Ural mountains was 185 poods 57 lbs. (6,660 English lbs.). The platinum found is chiefly obtained from the Nijni-Tagilsk mines, and the amount obtained was 143 poods (5,328 English lbs.). The richest copper ores in the Ural mountains are malachite and azurite; but the metal is extracted also from pyrites. The total amount found in 1862 was 248,865 poods (8,959,140 English lbs.). The amount of iron extracted in 1862 was 4,365,348 cwts., of which 2,778,400 cwts. were made into steel. In 1874 the smelting establishments of the Ural mountains produced 13,200,000 poods of bronze, 69,000 poods of steel, and 100,000 poods of copper. Among precious stones the most notable are the emerald, found on the eastern slope in the district of Ekaterinburg, and some of which weigh 13 dwts. 9 grains. Other precious stones are found, as the beryl, topaz, amethyst, and diamond, the last discovered in accordance with the prediction of Humboldt, but of small value. Malachite and jasper also occur. The pop. inhabiting the Ural mountains and supported by the mines, is 135,000 inhabitants.

URALSK, a Russian t., belonging to the territory of the Ural Cossacks, and included within the governorship of Orenburg, stands on the right bank of the Ural, 150 m. s.s.e. of Samara. It was founded in 1622 by the Ural Cossacks, and was till 1775 known under the name of Jaitsk. A good trade is carried on—the principal articles being fish, isinglass, caviare, tallow, and cattle. There are three great yearly fairs—in July, October, and January. Pop. '67, 6,166.

URANIA (i.e., “the heavenly muse”) was a daughter of Zeus and Mnemosyne. She was regarded as the muse of astronomy, and was represented with a celestial globe, to which she points with a little staff.

URANIUM (sym. U, equiv. 60—new system, 120—sp. gr. 18.4) is a very hard but moderately malleable metal, resembling nickel or iron in its luster and color; but in a finely comminuted state, occurring as a black powder. It is not oxidized by exposure to air or water at ordinary temperatures; but if heated in the air, it burns brilliantly, and is converted into oxide. It is a comparatively rare metal, which never occurs native; its sources being *pitch-blende*, which contains nearly 80 per cent of black oxide; *uranite*, which contains a hydrated double phosphate of lime and uranium; and *chalcocite*, which is a similar phosphate of copper and uranium. Uranium forms at least four oxides, viz., two principal ones—a *protoxide*, UO , and a *sesquioxide*, U_2O_3 ; and two intermediate oxides—the *black oxide*, $2\text{UO} \cdot \text{U}_2\text{O}_3$, and the *green oxide*, $\text{UO} \cdot \text{U}_2\text{O}_3$. For the methods of preparing these oxides, the reader may consult any of the larger chemical text-books. The black oxide is of much value as a pigment for coloring porcelain; and compounds of the sesquioxide (or peroxide) with the earths are employed to communicate a peculiar yellow tint to glass. The salts of the protoxide have a green, and those of the peroxide a yellow color. None of them are of any special importance. The metal is extracted from pitch-blende; and its isolation in a pure form is due to Peligot in 1841; Klaproth's supposed metal (which he discovered in 1789) turning out to be the protoxide. The metal was not obtained in the compact form till 1856.

URANOS, or **CÆLUS**, in mythology (a Greek word signifying heaven), son and husband of *Gæa* or *Terra*, the earth, and father of the Titans, Cyclopes, Hecatoncheirians, etc. He confined his children from their earliest infancy in Tartarus, but was overthrown and dethroned by Cronos, the youngest, at the instigation of *Gæa*. Out of the drops of his blood sprang the Gigantes, and Aphrodite rose out of the foam of the sea which gathered around him. He was succeeded on the throne of heaven by Saturn and Jupiter.

URANUS. See **PLANETS**, *ante*.

URBAN, the name of eight popes, of whom the following deserve to be specially noticed.—**URBAN II.**, a Frenchman by birth, and originally a monk of Clugny, was elected in a council held at Terracina, in the year 1088, during the schismatical pontificate of the anti-pope Guibert, styled Clement III. Urban's name was Otho, and he had been bishop of Ostia. Soon after his election he resumed possession of Rome, the for-

tresses of which had been occupied by the anti-pope, whom he compelled to withdraw. Guibert, nevertheless, was still supported by his patron, Henry IV. of Germany, who had long been at feud with the papal see; and Urban, in concert with the celebrated countess Matilda, having formed a strong party in Italy, Henry once more led an army thither, and excited in Rome against the pope a party, whom he induced to recall Guibert—Urban establishing himself at Anagni. The revolt of Conrad, the eldest son of Henry, against his father, and his coronation as emperor at Milan in 1093, and still more the successful appeal of Henry's queen, Adelaide, turned the tide of affairs in Italy. A great council was held at Piacenza in 1095, in which the anti-pope and his adherents were excommunicated. In the same council the crusade was proclaimed; and in the following autumn, Urban, in a council held at Clermont, made the well-known appeal on the same subject, which called forth that enthusiasm which was destined to lead to the long series of efforts for the recovery of the Holy Land, which forms so striking a characteristic of mediæval history. In his later pontificate Urban pursued the same course, and, in the end, succeeded in driving Henry IV. out of Italy. The most important event of the last years of his pontificate was the holding of a council at Bari in 1098, in which many Greek bishops were present, and in which the addition of the words *filio que* to the creed was discussed. Thence he returned to Rome, of which he obtained full and undisturbed possession; and he died in the close of 1099, just at the time when the first crusade which he had organized terminated in the successful occupation of Jerusalem.—URBAN V. (originally William de Grimoard) is remarkable as practically the last of the popes who resided at Avignon, and the one by whom the papal seat was for a time re-transferred to Rome. He was a native of France, and had been abbot of St. Victor at Marseille. On the death of Innocent VI. in 1362, he was elected at Avignon, where he continued to reside, sending his legate, cardinal Gil de Albornoz, to reduce the rebellious subjects of the papal see in Rome. After various alternations of peace and contest, Urban took the resolve of returning in person to the ancient seat of the papacy. He set out in 1367; and, landing at Corneto, proceeded first to Viterbo, and in the end to Rome, which he reached in Oct., 1367. He found the papal city in a condition all but ruinous, and the whole of Italy overrun by bands of mercenaries, and a prey to intestine divisions of the worst character. He endeavored, in concert with the queen of Naples, Joanna, in the following year, and of the emperor Charles IV., to repress these disorders, but with little success; and in 1370 he resolved once again to repeat the experiment of a withdrawal of the papal residence from Rome. He set out in September of that year; but only outlived his return to Avignon by a few weeks, and died in Dec., 1370, leaving the reputation of great personal piety, disinterestedness, and zeal for the interests of religion and morality.—URBAN VI. deserves a special notice as being the pope under whom the great western schism had its origin. His name was Bartolomeo Prignano, and at the time of his election he was archbishop of Bari. On the death of Gregory XI. (1378), who had finally returned from Avignon to Rome, and died in that city, Prignano was elected in a conclave held at Rome under circumstances of great excitement, owing to the apprehension, on the part of the populace, of an intention to elect a French pope, and again abandon Rome. The cardinals in the conclave numbered 16, of whom 12 were French, and 4 Italians. Prignano, although not a cardinal, was elected, April 8, 1378; and after the election had been made, the populace having broken into the hall, the cardinals dispersed; on the following day, however, they returned, confirmed the election, Prignano assuming the title of Urban VI., under which name he was crowned, April 18, in the presence of the 16 cardinals. In July of the same year the 12 French cardinals assembled at Anagni, and evoked the election of Urban, in which they declared that they had been acting under the fear of violence. To this course they are said to have been led by the rigor and the intemperate severity with which Urban was proceeding in the reforms of discipline, and especially of the simony and the irregular life of the clergy, including the cardinals themselves. They were joined by three of the Italian cardinals (one of them having died). On Sept. 20 they proceeded to elect the cardinal bishop of Cambray (born count of Geneva) pope, under the name of Clement VII. Clement took up his residence at Avignon. Urban, on the contrary, remained at Rome, where he appointed 26 new cardinals, and excommunicated Clement and his adherents. This conflict of claims was the origin of the WESTERN SCHISM (q.v.). Urban was recognized as the lawful pope by one portion of the west, Clement by the other, and each maintained his claim by measures of the most extreme character. Urban especially, although his title seems to have been best founded, weakened his cause by his excessive violence. Having engaged in a dispute with Charles, king of Naples, whom he had himself crowned, he was besieged by that prince at Novara, whence he withdrew to Genoa, taking with him, as prisoners, the cardinals of his party with whom he had quarreled, and several of whom he is said to have put to death. In 1389, while he was on his way to Ferentino, he fell from his horse, and, having been conveyed to Rome, died from the injuries thus sustained in October of that year.—URBAN VIII. was the successor of Gregory XV. His family name was Maffeo Barberini. He was born at Florence in 1568; and after a long series of brilliant services both in the domestic administration and in foreign nunciatures, he was elected pope in Sept., 1623. In the difficult position of Roman affairs, as complicated between France, Austria, and Spain, in the war of the Valtellina, to which he succeeded on his

first election, he acquitted himself with much dexterity. His pontificate was also signalized by the acquisition to the holy see of the duchy of Urbino (q.v.) in 1626. Urban died in 1644. His memory has suffered through the imputation of nepotism; but his administration was, on the whole, vigorous and enlightened. He was the founder of the celebrated college of the Propaganda, and to him Rome is indebted for many public works, including large and important additions to the Vatican library. Some of the early stages of the Jansenist controversy (q.v.) fall within this pontificate.

URBANA, a city, the co. seat of Champaign co., Ohio, on the Cincinnati, Sandusky and Cleveland, the Pittsburg, Cincinnati and St. Louis, and the Atlantic and Great Western railroads, about 100 m. n. of Cincinnati; pop. '70, 4,276. It is handsomely laid out with regular streets, and contains many fine residences. It is surrounded by a fine agricultural country, with which it carries on an extensive trade. Its manufactures are also important and growing. It has a fine high school building, 4 newspapers, banks, insurance companies, a public library, also the Urbana university, a Swedenborgian institution, the only college under the control of that denomination in this country. The largest manufactures are the shops of the U. S. rolling stock company. Another large concern is the Urbana machine works. Carriages, stoves, furniture, woolens, wagons, shoes, etc., are among the articles manufactured here.

URBI ET ORBI (Lat. to the city and the world), a form used in the publication of papal bulls, for the purpose of signifying their formal promulgation to the entire Catholic world, as well as to the city of Rome. By the canon law one of the conditions required in order that any new law shall be held to have force is "promulgation;" but a very celebrated controversy arose in the 17th c. as to the kind of promulgation which should be regarded as sufficient. In ancient times the practice of the popes had been to send copies of their bulls to the primates, metropolitans, and other ecclesiastical heads of the several churches, to be by them communicated to their suffragan bishops; but in progress of time the practice of publicly proclaiming or of posting up the decree in the Campo dei Fiori in Rome was substituted for this transmission; and decrees addressed URBI ET ORBI, and published in this way, were held to be thus sufficiently promulgated to the various churches, and to be thenceforth of full force. The French jurists of the 17th c. strenuously controverted this view. The controversy is of little importance, even in the Roman Catholic church, in these days of universal publicity and of rapid and simultaneous diffusion of intelligence.

URBINO, in central Italy, capital of the province of Urbino and Pesaro, situated 20 m. s.w. of Pesaro, and between the rivers Metauro and Foglia. Its walls date from the 14th c.; it has a magnificent palace, once the residence of the dukes of Urbino, where was the famous library of the Della Rovere family, afterward removed to the Vatican. Another handsome palace is that of the Albini, belonging to an Albanian family escaped from the ferocity of the Turks and subsequently settled in Urbino, where they became rich and powerful and gave a pope to the church, who took the name of Clement XI. Urbino is an archiepiscopal see. Its manufactures are unimportant, except a pin factory. It is the birthplace of Raphael. Pop. 8,000. Urbino was a *municipium* under the Romans, and during the middle ages became the seat of a race of independent dukes, who existed up to 1626, when on the death of Francesco, the last duke, Urban VIII. took possession of the duchy as a vacant fief; and it continued to form part of the papal states till 1860, when it became part of the kingdom of Italy.

URCHIN, SEA. See ECHINIDÆ.

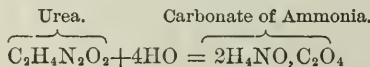
URE, ANDREW, M.D., a distinguished chemist, was born at Glasgow in 1778, educated at Glasgow university, subsequently prosecuted his medical studies at Edinburgh and returned to Glasgow, where he received the degree of M.D. in 1801. In 1802 he became professor of chemistry and natural philosophy in the Andersonian institution (q.v.), took an active part in the establishment (1809) of an observatory at Glasgow, and was appointed its first astronomer. In 1813 he made his appearance in the literary world as the author of a *Systematic Table of the Materia Medica*, which was followed in 1818 by *New Experimental Researches on Some of the Leading Doctrines of Caloric*, a memoir which, read before the royal society and printed in the *Philosophical Transactions*, brought Ure prominently into notice as a natural philosopher. Several papers on chemical subjects, the fruits of his accurate and extensive researches, followed. In 1821 appeared his *Dictionary of Chemistry*; in 1822 a paper *On the Ultimate Analysis of Animal and Vegetable Substances*, one of the earliest contributions to organic analysis, and a translation of Berthollet on *Dyeing*; and in 1829 a *System of Geology*, in which the hypothesis of a general flood was maintained. In 1830 Ure removed to London, and in 1834 was appointed analytical chemist to the board of customs. The products of his pen from this time assume more of a technological character, as the *Philosophy of Manufactures* (1835), *The Cotton Manufacture of Great Britain Compared with that of other Countries* (1836), and *Dictionary of Arts, Manufactures, and Mines* (1839). A seventh edition of this last work was edited by Robert Hunt in 3 vols. (1875), and a supplementary volume was added in 1878. Ure was chosen a fellow of the royal society in 1822, as well as of the geological, astronomical, and other societies. He died in London, Jan. 2, 1857.

UREA ($C_2H_4N_2O_2$) is an organic matter which derives its name from its having been originally discovered in the urine, of which it forms the most important and characteristic ingredient. It was until recently regarded as an organic base or alkaloid; but during the last few years it has been placed amongst the *amides*, a group of neutral, and for the most part crystallizable compounds, of the *ammonia type* (see TYPES, CHEMICAL), in which one of the three equivalents of hydrogen is replaced by the radical of an organic

acid. For example, if R represent the radical, $\left. \begin{matrix} R \\ H \end{matrix} \right\} N$ represents the corresponding amide; and the character of the type is not affected by doubling the entire number of

molecules, or changing it into $\left. \begin{matrix} R_2 \\ H_2 \end{matrix} \right\} N_2$. Now, if in this formula we substitute C_2O_2 (carbonic oxide or carbonyl, as it is now often termed) for R_{22} , we obtain $\left. \begin{matrix} C_2O_2 \\ H_2 \end{matrix} \right\} N_2$, which is

identical with $C_2H_4N_2O_2$, and possesses the advantage of showing the probable grouping of the elements in urea. Pure urea, which has been allowed to crystallize slowly, occurs in white, glistening, streaked, four-sided prisms; but when the crystallization is rapid or disturbed, it separates in small white silky needles. It is devoid of smell, has a coolish, bitter taste, like that of saltpeter (which it closely resembles in its external form) and is very slightly deliquescent. It is readily soluble in water and alcohol, but only slightly in ether. When heated to about 248° , it fuses, evolves ammonia, and becomes completely decomposed. A solution of pure urea in distilled water may be kept for a long time, and may even be boiled without undergoing decomposition; but if heated in a close tube to about 284° , each equivalent combines with four of water, and is converted into carbonate of ammonia, according to the formula—



A similar change takes place slowly at ordinary temperatures in the urea contained in the urine, the mucus of the bladder acting as a ferment, and thus rendering urine ammoniacal after it has been kept for a few days.

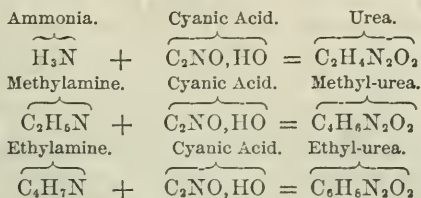
The following are some of the most important of the compounds of urea: *Nitrate of urea* ($C_2H_4N_2O_2, NO_3, HO$) and *oxalate of urea* $\{2(C_2H_4N_2O_2), C_4O_6, 4HO\}$ are readily crystallizable salts, formed by the direct addition of the respective acids to a moderately strong solution of urea. As nitrate of urea requires eight parts of cold water, and is still more insoluble if an excess of free nitric acid is present, and the oxalate is more insoluble than the nitrate, while urea dissolves in its own weight of water, these salts may be employed to test for and approximately determine the quantity of urea. Among the compounds of urea with metallic oxides, those which it forms with the oxides of mercury are especially interesting, and have been completely examined by Liebig. A result of his researches is his celebrated method, which is now in universal use, of determining the amount of urea volumetrically.

Urea occurs as the main and characteristic ingredient of the urine of man and mammals, being most abundant in that of carnivorous, and least so in that of vegetable feeders. The average quantity excreted by the human subject is mentioned in the article URINE. It is also a constituent of the fluids of the eye, of the sweat, and (in minute quantity, of the blood, and of the liquor amnii (of the fetus). There can be no doubt that it is a final product of the regressive metamorphosis of the living tissues, or of their disintegration into simpler compounds, by means of which the final elimination of the worn-out structures is facilitated. Thus, we find that urea may be obtained by oxidizing agents from uric acid, creatine, allantoin, etc., in the laboratory, and there is every reason to suppose that similar changes may occur in the system. Whether, when an excess of food is taken, a portion of it may be formed in the blood into urea, and then at once separated without ever having entered into the structure of the higher tissues, is a point which is scarcely decided.

Until the discovery by Liebig and Wöhler of the artificial formation of urea, its only source was the urine, from which, after evaporation, the nitrate was separated, purified by animal charcoal, and the urea liberated by the addition of carbonate of baryta, and finally extracted by alcohol, from which it was allowed to crystallize. It is now known that there are many different ways of forming it, as (1) by the action of chlorocarbonic oxide or phosgene gas ($C_2O_2, 2Cl$) on dry ammonia; or (2) by heating a mixture of carbonic ether ($2C_2H_5O, C_2O_4$) and an alcoholic solution of ammonia to about 356° in a closed tube (both of which methods show that urea is truly the *amide of carbonic acid*); but the best practical method is essentially the original one of mixing water solutions of cyanate of potash and sulphate of ammonia, and evaporating the solution, which leaves a residue consisting of urea and sulphate of potash, the former of which may be extracted by alcohol.

UREAS, THE COMPOUND, include a large class of singular organic bodies, for the knowledge of which chemistry is mainly indebted to prof. Hofmann. Compounds of this kind are most readily formed by the action of cyanic acid on the amide or amidogen

bases of the alcohol radicals, such as methylamine, ethylamine, etc. (the methyllia, etc., of Miller and other chemists), instead of on ammonias. Thus, while ordinary urea is formed by the action of this acid on ammonia, methyl-urea, ethyl-urea, etc., are formed by its action on methylamine, ethylamine, etc., as shown in the following formula:



These are the simplest forms of these compounds; among the more complicated ones are ethyl-methyl-urea, $\text{C}_6\text{H}_{10}\text{N}_2\text{O}_2$, phenyl-ethyl-urea, $\text{C}_{13}\text{H}_{12}\text{N}_2\text{O}_2$, etc. All these compound ureas combine like ordinary urea with acids, and form crystallizable salts.

UREDO, a genus of minute parasitic fungi, of the order *coniomycetes*. The original genus *uredo* has been divided into many genera, forming a group called *uredineæ*, which contains a multitude of species, parasitic on phanerogamous plants of almost every natural order, and in all parts of the world, at the equator and at the extreme limits of arctic and antarctic vegetation. Different plants have their own peculiar parasites of this kind, or the same *uredineæ* are at least confined to plants nearly allied. A few species occur on ferns, but not very frequently. Every external part of plants, except the roots, is liable to be infested with these fungi, and some of them attack the inner tissues, their spores at length breaking through the outer strata of cells. Submerged parts of plants are never affected by them, for fungi dislike water; but the floating portions of aquatic plants are not exempt; and in all cases a moist atmosphere seems to be favorable to their development. Rank luxuriance of growth is often attended by their appearance. A plant once attacked is afterward subject, if perennial, to the same parasite, even if removed to another situation. There is reason to believe, from experiments made by Fée, that the spores of the *uredineæ* are taken up by the roots of plants from the soil, and find their way with the sap to the place proper for their growth. See BRAND, BUNT, MILDEW, RUST, and SMUT.

URENA, a genus of herbaceous plants of the natural order *malvaceæ*. The bark is very fibrous; and the fiber of *U. lobata* and *U. sinuata*, weeds common in most parts of India, is used as a substitute for flax. It is strong, and tolerably fine.

URETERS (Gr. *ouron*, urine, and *terein*, to keep), the canal by which the urine is conveyed from the pelvis of the kidney (see KIDNEYS) on either side to the base of the bladder. Each ureter is about 18 in. in length, and enters the bladder in so slanting a direction as to prevent regurgitation.

When a concretion is formed in the kidney, the ordinary and most favorable event is that it should descend through the ureter to the bladder. The passage of a stone through this tube gives rise to a series of violent symptoms, which are thus summed up by Druitt: "The patient complains of sudden and most severe pain, first in the loins and groin, subsequently in the testes (in the male) under the thigh. The testes are also retracted spasmodically. At the same time there are violent sickness, faintness, and collapse, which may last two or three days, and are only relieved when the stone reaches the bladder."—*The Surgeon's Vade-mecum*, 8th ed., p. 594. The treatment consists in the warm bath, and the inhalation of chloroform, or opium in large doses (both of which serve to allay spasm and deaden pain), the free use of diluents to wash down the concretion, and if the sickness is very severe, an occasional tumbler of hot water containing half a tea-spoonful of carbonate of soda.

URETHRA is the term given in anatomy to the canal by which the urine is discharged from the bladder. Its most common affections are the special inflammatory condition of its mucous lining, known as gonorrhœa (q.v.), and stricture (q.v.).

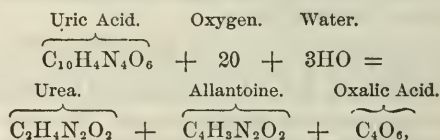
URFA, or **ORFA**, the modern name of EDESSA (q.v.).

URGA, a town of Mongolia, on the river Tola, stands in a valley, at the height of 4,100 ft. above sea-level, 350 m. s.e. of Irkutsk. In one of the suburbs of the town is a college of Mongolian priests, which is the seat of the Lama of the Mongols. See LAMASISM. The college or convent covers an extensive area, and includes the dwellings of the priests. The population is made up of a colony of Chinese and about 25,000 Mongols, 10,000 of whom are priests. Each family educates one of its children to be a priest. The buildings of the college have of themselves more the appearance of a town than the other quarters of Urga. The number of the inhabitants is not stated.

URI, one of the Waldstädten or forest cantons of Switzerland, forms part of the hill country (see SWITZERLAND) which surrounds the lake of Lucerne, and is bounded on the w. by the cantons of Unterwalden, Bern, and Valais. It has an area of 414 sq.m.,

and its pop. in '70 was 16,107; in '76, 16,900. It consists of one valley, that of the Reuss, about 30 m. in length, and inclosed on all sides by lofty mountain chains, which also include the south-eastern bay or reach of the lake into which the river falls. A great high-road passes through the valley, and terminates on the south at the St. Gothard pass which connects the Uri with Ticino, and forms part of one of the great routes into Italy. Uri is almost entirely pastoral, and its products are those of its herds and flocks. Goats are very numerous. In the low grounds, there are a few fields of corn and potatoes, and gardens and orchards, but even this cultivation is limited. The population speak a Swiss-German dialect, and are Roman Catholic. Uri is a democracy. The landesgemeinde, held in a meadow once a year, is formed of the whole male population who have reached 20 years of age. The highest power resides in this assembly. The preconsideration and superintendence of the law belongs to the *landrath*, which consists of 7 members chosen by the landesgemeinde, and 61 by the several communes. A governing council of 11 members, with the landamman as president, discharges executive functions. Civil justice is administered in the highest instance by a cantonal court of 11 members. A tribunal of 7 members decides in criminal causes. Altorf, the capital, is a small town, with (1870) 2,724 inhabitants. A fountain surrounded by stone statues of Tell (q.v.) and his son marks, according to tradition, the spot where the former took his aim, and another that where the boy stood with the apple on his head.

URIC or LITHIC ACID ($C_{10}H_4N_4O_6$) derives its names from its being a constituent of urine and of urinary calculi respectively. In a state of purity, it occurs in the form of a loose white powder or scales consisting of minute crystals, devoid of smell or taste, only very slightly soluble in water (1 part requiring about 15,000 parts of cold, and 1800 of boiling water), and quite insoluble in alcohol and ether. This acid is, however, soluble without decomposition in strong sulphuric acid, and it may be thrown down from this solution by the addition of water. It is also soluble in the carbonates, borates, phosphates, lactates, and acetates of the alkalies, extracting from these salts a part of their base, with which it forms acid urates. Litmus paper is reddened by its moist crystals, or by a hot watery solution. This acid is not volatile, and by dry distillation is decomposed into carbonate of ammonia, urea, cyanuric acid, hydrocyanic acid, etc. On heating a mixture of uric acid and water, with gradual additions of peroxide of lead, which is a strong oxidizing agent, the uric acid becomes oxidized, takes up water, and becomes converted into urea, allantoin, and oxalic acid, as is shown by the equation:



the lead being left in combination with the oxalic acid. This is a most important result in its physiological bearing, since it shows how uric acid is a probable stage toward the formation of urea, and as explaining a probable source of the oxalic acid, which is often present in the urine in cases of deficient respiration and acration; and this view is confirmed by the experiment of introducing uric acid into the stomach or veins of an animal, when the presence of oxalate of lime, and the augmentation of urea, are very soon perceived in the urine.

Uric acid is a very weak bibasic acid, forming with bases two series of salts, the neutral and the acid, of which the former are the more soluble. Among the most important of these urates are—(1) *neutral urate of potash*, which occurs in the form of a white granular crystalline powder, difficult of solution in water (requiring 44 parts of cold, and 35 of boiling water), but readily soluble in an excess of potash, from which solution carbonic acid throws down the *acid urate of potash* in the form of a transparent jelly, which sometimes falls in the form of a powder; (2) *two urates of soda*, each of which is less soluble than the corresponding potash salt; (3) *acid urate of ammonia*; (4) *acid urate of magnesia*; (5) *two urates of lime*; and (6) *urate of lithia*, which is more soluble than any other urate; and hence lithia water is an important therapeutic agent in converting uric acid and the more insoluble urates into a soluble salt in the living body.

Uric acid is widely distributed throughout the animal organism. It occurs not only in the urine of man and carnivorous animals, but is the chief constituent (either free or in combination) of many calculi occurring in the kidneys or bladder, and of numerous urinary sediments. The urinary secretion of birds and reptiles consists almost entirely of urates, which are also found in the excrements of caterpillars, butterflies, beetles, etc., and of many mollusks. Moreover, in very minute quantities, it occurs as a urate in healthy blood, in which fluid it has been found in excess in gout and Bright's disease, and is a constituent of the aqueous extract of the spleen, liver, lungs, pancreas, and brain. The *chalk-stones* occurring about the smaller joints, and in the lobes of the ear of gouty patients, consist mainly of urate of soda.

The best and most ready mode of obtaining pure uric acid is from the semi-solid urine of serpents, which consists almost entirely of urates. The mass is boiled with

potash, which expels any ammonia that is present, and a stream of carbonic acid is then passed through the strained potash solution, which throws down acid urate of potash. This precipitate is dissolved in water, and decomposed by hydrochloric acid, which throws down the uric acid in minute crystals. The form in which this acid crystallizes is liable to great variations. Sometimes we have flat tablets resembling whetstones, or sections with a double knife through biconvex lenses; at other times, more or less perfect rhombic tablets, and sometimes hexagonal plates, barrel-shaped prisms, and toothed crystals. If there is any doubt as to the nature of the crystals, they should be dissolved (under the microscope) in a little potash solution, and a drop of hydrochloric acid then added, when sufficiently characteristic forms are sure to appear.

The marvelous researches of Wöhler and Liebig on the products of decomposition of uric acid by nitric acid, constitute an epoch in organic chemistry. The most important products, some of which are obtained directly, and others indirectly, are: (1.) *alloxan*, $C_8H_2N_2O_8$ (which under the influence of various reagents, yields *alloxanic acid*, *oxalic acid*, *mykomelinic acid*, and *dialuric acid*); (2.) *parabanic acid*, $C_6H_2N_2O_6$ (which yields *oxaluric acid*); (3.) *alloxantine*, $C_8H_2N_2O_{20}$ (which yields *alloxan*, *allituric acid*, *urumel*, *thionuric acid*, *oxaluric acid*, and *murexide*); (4.) *murexide*, $C_{12}H_8N_4O_{12}$ (which yields *murexan*, or *uramel*, and *alloxan*); and (5.) *urea*, which breaks up into carbonic acid and ammonia. Moreover, by boiling oxaluric acid with water it is decomposed into oxalic acid and urea. Of these substances, we shall only notice *murexide*, which has two special claims to notice. It is used as a pigment in dyeing, being probably the old *Tyrian purple* (see MUREXIDE), and it affords a ready test for a mere trace of uric acid. In using it for the latter purpose, the substance supposed to contain uric acid is heated on a slip of glass with a drop of nitric acid, and carefully evaporated to dryness. If uric acid is present, the residue has a red color, which is converted by vapor of ammonia into a fine crimson, and the addition of a drop of a solution of potash develops a splendid purple tint, which disappears on the application of heat.

Uric acid must be regarded, like urea, as a product of the disintegration of the tissues; and it is far from improbable that all the urea which is secreted may have pre-existed in the form of uric acid—a view which is supported by the fact, that whatever (like excessive exercise or water-drinking) increases the amount of urea, decreases that of uric acid, and *vice versâ*. See URINE.

URICONIUM, an ancient Roman city of Britain, the site of which is about 4 m. to the e. of Shrewsbury, and is partly occupied by the village of Wroxeter. The original name seems to have been *Viroconium*, which was changed in the later Roman-British period to Uriconium. It is mentioned by Ptolemy as existing in the beginning of the 2d c. A.D. The remains of the city show it to have been a place of much importance. The wall can still be traced near the banks of the Severn, forming an irregular oval rather more than 3 m. in circumference. It appears that one of the principal streets of the city occupied the line of the *Watling street road*. The remains of Uriconium have recently been explored by an association formed for the purpose at Shrewsbury, and many curious relics of antiquity have been discovered, throwing great light on Roman civilization in Britain. The human remains found in the excavations which have been made, affording proof of death by violence or by suffocation, show that the city did not slowly decay, but was sacked and burned by enemies, which probably took place about the 5th century. Of this, however, there is no certain historic record. The ruins seem to have remained with little change, except the gradual process of decay, till about the 12th c., when they were used as materials for other buildings. Some of the churches of the neighborhood were built of the old Roman bricks. The walls of buildings are now found, perfect as far as the previous accumulation of earth rendered it difficult to remove the bricks of which they were constructed. The most remarkable relic of antiquity in Uriconium is the *old wall*, a great mass of Roman masonry, which appears to have been the side of a great edifice, remains of Mosaic pavements having been found near it, and apparently connected with it. The edifice to which the old wall belonged is supposed to have occupied a corner at the junction of two principal streets. The excavations which have been made, however, leave it very difficult to explain the character and purpose of the remains discovered. Several inscriptions have been found at Uriconium, but none of great interest. A museum has been formed at Shrewsbury, in which most of the antiquities from this spot are collected. Hair-pins, combs, and rings are particularly numerous among them.

URIM AND THUMMIM (Heb.), a mysterious contrivance in or on the high-priest's breast-plate, either consisting of the four rows of precious stones upon which the names of the 12 tribes were engraved, or of two images personifying—most probably—"Truth" and "Revelation." Luther's translation, "light and truth," has no more real foundation than that of the LXX. and the Vulgate, which is "utterance and truth." To this translation, the fact of the picture of "Truth" (*Aletheia*)—in sapphire or other precious stones—being suspended from the Egyptian high-priest's breast, had probably given rise. The etymology of the two words, which, derived from Arabic roots, would indicate "brilliant amulet," "perfect light," etc., is in reality no more satisfactory than the account of the manner in which the contrivance was used for oracular purposes, or of the time when, in reality, it ceased to act. It is never mentioned after Solomon's time.

URINARY SEDIMENTS is a general term which includes all those substances which occur in a non-dissolved state in the urine. Most of these sediments are not formed until after the urine has been discharged and has cooled; some, however, are formed in the urinary organs, and under favoring conditions may give rise to urinary concretions. Hence it is a point of importance to ascertain whether a sediment occurring in a specimen of fresh urine has been formed before or after its discharge.

The chemical and microscopical character of these sediments has a double bearing on the detection of disease: (1.) "From the investigation of these sediments," says professor Vogel, "we can draw sure conclusions regarding special changes that are going on in the general nutrition of the body. They show us that an excessive quantity of certain substances (as for example, uric, hippuric, or oxalic acid) is being discharged with the urine, and has therefore been produced in the body; and we thus often obtain at a glance information of great importance, which could otherwise only be procured by a tedious process; and (2) they point out to us certain local diseases of the urinary system. Thus, from a sediment containing pus, we infer that suppuration is going on in some part of that system; and the presence of cylindrical casts or tubes in the sediment informs us of certain morbid changes in the structure of the kidneys; and if the ordinary symptoms reveal the presence of stone in the bladder, we can ascertain its probable nature from the character of the sediment or gravel."

The mode of formation of morbid sediments is well illustrated by a sketch of the changes which healthy urine undergoes after prolonged exposure to the air. In the course of two or three days, the acidity of the urine is found to have increased, and this condition of *acid fermentation* will frequently continue for some weeks, giving rise to the disposition of (1) free uric acid; (2) acid urates (chiefly urate of soda); and (3) oxalate of lime. In a few weeks, or often much sooner, the urea becomes alkaline, or *alkaline fermentation* is established, in consequence of the urea being converted into carbonate of ammonia. The urine now becomes paler, while the red or yellow crystals of uric acid are replaced by white amorphous granules and colorless refracting prismatic crystals. In other words, the former precipitate is replaced by (1) phosphate of ammonia and magnesia (commonly known as triple phosphate); (2) phosphate of lime; and (3) urate of ammonia. In certain forms of disease, these changes take place much more rapidly, and the second change—the alkaline fermentation—may occur without a pre-existing acid fermentation, and even within the bladder. In addition to the above-named substances, which arise from the decomposition of healthy urine, others occur in various morbid conditions of the system; and we may divide the urinary sediments generally into the two great groups of (1) the unorganized and (2) the organized deposits. The unorganized sediments include uric acid, the urates (chiefly urate of soda), hippuric acid, oxalate of lime, earthy phosphate (viz., phosphate of lime, and triple phosphate), cystine, xanthine, pypoxanthine (formerly known as guanine), and tyrosine; while the organized sediments include mucus and epithelial scales, blood corpuscles, pus corpuscles, cancerous and tubercular matter, fibrinous casts of the tubes of the kidney, spermatozoa, fungi, infusoria, etc. Of the unorganized sediments uric acid, the urates (excepting urate of ammonia), hippuric acid, and cystine occur only in acid urine, and urate of ammonia, triple phosphate and phosphate of lime, in alkaline or neutral urine. Oxalate of lime and the organized sediments occur both in acid and alkaline urine; but alkaline urine is the more natural *habitat* for fungi and infusoria. It is comparatively seldom that a sediment consists of a simple ingredient. Most of our knowledge on this important subject is due to the labors of English physicians, among whom the names of Prout and Goffing Bird are especially deserving of notice. For details regarding the mode of treatment suitable in the most important of the sediments, we may refer to the articles **LITHIC ACID DIATHESIS**, **OXALURIA**, and **PHOSPHATIC DIATHESIS**, in this work, and to Dr. G. Bird's *Urinary Deposits and their Treatment*; while for details regarding their chemical and microscopical characters, Neubauer and Vogel, *On the Urine*, translated under the auspices of the New Sydenham society, may be consulted.

URINE is the fluid which is secreted or separated by the kidneys from the blood, and it is the principal means of removing the worn-out tissues, especially the nitrogenous and saline matters, from the system. It is a very complex fluid, and its composition varies considerably in different classes of animals, and mainly in accordance with the nature of the food.

Healthy human urine, when freshly discharged, is a clear fluid of a bright amber color, a bitter, saltish taste, and a peculiar aromatic odor. Its normal reaction is acid, and its specific gravity ranges from 1.015 to 1.025. From a table published in Day's *Physiological Chemistry*, p. 352, it appears that an adult man of ordinary weight (about eleven stones) secretes in 24 hours about 52 fluid ounces (or rather more than two pints and a half) of urine, the range extending from 40 to 70 ounces; and that these 52 ounces yield, on evaporation, 935 grains of solid constituents, the remainder being water, which is expelled by heat. Of these 935 grains, 520 (or more than an ounce) are composed of urea (q.v.), and 266 of chloride of sodium (or common salt); while the remaining 149 grains are made up of uric acid (q.v.), hippuric acid (q.v.), sulphuric acid, 32 grains; phosphoric acid, 54 grains; earthy phosphates, 15 grains; ammonia (in the form of hydrochlorate), 11 grains; with smaller quantities (in most cases mere traces) of creatinine

(q.v.) and creatine (q.v.), xanthine, hypoxanthine, coloring matters, mucus (from the walls of the bladder), iron, silica, and fluorine. The fluid also holds an undetermined quantity of gases (carbonic acid and a little nitrogen) in solution. The most characteristic and important of these ingredients is the *urea*, the daily excretion of which is modified by various circumstances. On a purely animal diet, Lehmann found that he secreted two-fifths more urea than when he was living on an ordinary mixed diet; while on a mixed diet there was secreted almost one-third more than on a purely vegetable diet; while finally, on a non-nitrogenous diet, the amount of urea was less than half the quantity secreted during a mixed diet. The free use of common salt increases the daily excretion of urea, in consequence, doubtless, of its augmenting the rapidity of the destructive action always going on in all the tissues; while alcohol, tea, coffee, and tobacco (whether smoked or chewed) diminish the daily quantity. The only medicine which increases its quantity to any marked degree is *liquor potusse*. The daily quantity is increased in many diseases (typhoid fever and many other acute diseases, especially inflammation of the membranes of the brain), while in Bright's disease and a few other disorders, it is diminished. The daily amount of excreted *uric acid*, like that of urea, varies with the nature of the food. Thus, for instance, prof. Haughton found that the mean daily quantity of uric acid excreted by meat-eaters and wine-drinkers was 4.5 grains, while vegetarians yielded an average of only 1.48 grains, part of which, moreover, was hippuric acid. As an excess of uric acid is likely to give rise to gravel or stone, it should be generally known that the free ingestion of water diminishes its excretion, while at the same time it increases the amount of urea, into which the uric acid is probably transformed by oxidation. The daily amount is diminished by strong bodily exercise, and increased by repose; the reverse of what holds good in relation to the urea. The amount is increased when the digestive functions are disturbed, as after the use of indigestible food or excess of alcoholic drinks; in those conditions of the system which are associated with much disturbance of the functions of respiration and circulation; and in disorders accompanied with severe febrile symptoms, such as acute rheumatism. Its entire absence seems compatible with perfect health. With regard to *hippuric acid* there has been much discussion, not only as to the quantity in which it occurs, but as to whether it actually exists in healthy urine. Thus, Weissman, a German chemist, finds that on a mixed diet he secreted more than 40 grains, of this acid daily, and on a purely animal diet, only 12 grains. Duchek and Höfle deny that it is a constant ingredient of healthy human urine; and prof. Haughton only met with it once in the urine of ten men. Dr. Bence Jones, a very trustworthy chemist, found that a man, A, weighing 152 lbs., and a man, B, weighing 202 lbs., living on a mixed diet, excreted daily, on an average, 4.9 and 6.5 grains of hippuric acid, the corresponding quantities of uric acid being 7.7 and 12.6 grains. In cases of jaundice, no traces of hippuric acid are present, even after the administration of benzoic acid,* which is usually converted in the system into hippuric acid. Hence it may be inferred that a healthy condition of the urine is essential to the formation of this acid in the system. Nothing is known with certainty regarding the diseases in which this acid is secreted to excess. The only other characteristic ingredient of the urine is its *coloring matter*. Prof. Harley believes that he has isolated the normal urine-pigment, to which he applies the term *urohematin*; and from its always containing iron, and on other grounds, he regards it as modified hæmatin or blood-pigment. Mr. Schunck has also shown that indigo-blue, in very small quantity, is almost always present.†

It has been already stated that fresh healthy human urine presents an acid reaction. This reaction mainly depends upon the presence of acid phosphates of the alkalies and earths, although the presence of free acids, such as free hippuric, or possibly lactic acid (which, however, is not a normal ingredient), may occasionally contribute to increase the acidity. To determine the acidity of the collective 24 hours' urine, we take a solution of oxalic acid of known strength, and ascertain the relative quantities of a solution (of definite strength) of caustic soda which are required to perfectly neutralize equal volumes of the urine and of the oxalic acid solution. In this way it is found that the total quantity of free acid in the daily urine of a healthy man corresponds in neutralizing power to about 36 grains of oxalic acid. The degree of acidity varies in different parts of the day. Dr. Bence Jones mooted the idea (in 1849), that the respective acidities of the secretions of the kidneys and stomach stood in an inverse relation to one another, and may even become alkaline during stomachal digestion. Dr. Roberts of Manchester, who has subsequently investigated this point, finds that the effect of a meal on the acidity of the urine begins to show itself in the second hour afterward, is most marked during the next three hours, and disappears by the end of the sixth hour, the fluid being almost always positively alkaline during the third and fourth hours. Independently of this periodic alkalinity, the urine may be made alkaline at will by the administration of caustic alkalies, their carbonates or their salts, with organic acids (citrate, tartrate, etc.; such

* Duchek found that when 1 gramme (15.44 grains) of benzoic acid was taken, 0.714 of a gramme of hippuric acid was excreted; when 2 grammes were taken, 1.857 grammes of hippuric acid, and 0.421 of benzoic acid, were excreted; and the ingestion of 4 grammes was followed by the excretion of 1.714 of hippuric acid and 2.500 of benzoic acid. Hence the limit of conversion had been already exceeded.

† He failed to detect it in only one case out of forty. He only succeeded in obtaining one grain by working for several weeks on the urine of two persons. The urine of the horse and cow yielded comparatively large quantities.

as occur in many fruits); while after the administration of acids the acidity is much increased.

In disease, the urine may either contain only its ordinary ingredients in abnormal proportions, or it may contain ingredients not occurring in the healthy fluid. Thus there may be an excess or diminution of urea, an excess of uric acid, a diminution of chloride of sodium, which, in cases of inflammation of the lungs, may fall from 266 grains to a mere trace, and, by its daily diminution or augmentation, tells with certainty whether the disease is gaining or losing ground; an excess of coloring matter or of mucus, etc.; or, on the other hand, the urine may contain albumen, sugar, oxalic acid (in combination with lime), fat, leucine and tyrosine, bile-pigment, biliary acids, etc. The subject of "the urine in disease," is, however, so wide a one that we must refer our readers for details to Lehmann's *Physiological Chemistry*, 3 vols. (translated for the Cavendish society), to Dr. Parkes's excellent work on *The Urine*, and to the various works of Dr. Beale.

We conclude with a few remarks on the urine of mammals generally. The urine of the carnivora is clear, of a light-yellow color, a disagreeable odor, a nauseous taste, and an acid reaction. It contains much urea, little pigment, and little or no uric acid. The urine of the herbivora is turbid, yellow, of a less unpleasant odor, and alkaline. In addition to urea, it contains hippuric (but no uric) acid, alkaline lactates, carbonates of potash and of the earths, oxalate of lime, and a small quantity of phosphates. By reversing the natural food of these classes, we reverse the characters of the urine.

The urine in many forms of disease becomes turbid on cooling, and soon deposits a sediment; and even healthy urine, after a few days's exposure to the air, loses its clearness, and throws down a deposit of mucus and various kinds of crystals. The investigation of the nature of the deposits thrown down by comparatively fresh urine in disease, is a subject of the highest importance in medicine, and is noticed in the article URINARY SEDIMENTS.

URINE, INCONTINENCE OF, or ENEURESIS, is a troublesome affection, far more common in childhood than in more advanced life. The child may have no bad symptom of any kind that can be detected, but it is in the constant habit of discharging its urine in bed during sleep. It sometimes wakes with a consciousness that it is performing the act, but most commonly it is not disturbed. The act may take place once, or several times, during the night, and sometimes there is an interval of a night, but seldom more. The child may often be broken off this unpleasant habit by proper domestic management, as withholding any excess of fluids before going to bed, and by waking it, and making it discharge the contents of the bladder at the time when the elder members of the family retire to bed. When such means as these fail, recourse must be had to medical advice. Blisters to the sacrum, which prevent the patient from lying flat on the back, and consequently prevent the urine from gravitating toward the most irritable part of the bladder, are often useful; and cold douches to the spine, combined with the internal use of chalybeates, are frequently serviceable. The most certain remedy, however, is extract of belladonna, given at first, according to the age of the patient, in doses varying from $\frac{1}{16}$ to $\frac{1}{4}$ of a grain, twice daily, and increasing it, if required, till it gives rise to marked constitutional disturbance.

The various forms of mechanical pressure that have been suggested, with the view of preventing the passage of the urine, cannot be too strongly reprobated.

URQUHART, DAVID, b. Scotland, 1805; educated at St. John's college. In 1835 he was secretary of legation at Constantinople, but opposed Palmerston's eastern policy and therefore resigned his position. He sat in parliament as conservative member for Stafford, 1847-52. He is the author of *Turkey and its Resources*, *The Mystery of the Danube*, and other books bearing on the eastern question.

URQUIZA, JUSTE JOSÉ DE, 1800-70; b. Entre Rios; of Spanish and Indian descent. In the La Plata war he was general of division under Rosas. In 1840 he led the Uruguayan invasion, and in 1845 won the victory of India Muerte. In 1857, then being governor of Entre Rios, he became involved in quarrels with Rosas, head of the Argentine confederation, raised an army from Brazil, Paraguay, and Uruguay, routed Rosas at Santos Luzares, and made himself dictator of the Argentine republic. From 1854 until his death he was engaged in war with Buenos Ayres, and was generally unsuccessful. He was assassinated May 14, 1870.

URSA MAJOR, "the Greater Bear," and URSA MINOR, "the Lesser Bear," are two celebrated constellations in the northern hemisphere of the heavens. *Ursa Major* was distinguished as early as the time of Homer by the names *Arktos*, "the Bear," and *Hamaxa*, "the Wagon," the vivid imagination of the Greeks discovering a fanciful resemblance between these objects and the group of brilliant stars in this constellation. The Roman name *Ursa* was a translation of the Greek *Arktos*; the Romans also called its seven bright stars the *Septentriones*, "the seven plowing oxen," whence the adjective *septentrionalis* came to signify north. The common names throughout Europe for these seven stars are "the Plow," "Charles's Wain," "the Wagon"—evidently derived from the classical epithets above mentioned. When the constellation of *Ursa Minor* was generally recognized, the adjective *megale*, "great," was annexed by the Greeks, and *major*, "greater," by the Romans, to the name of this constellation. The remarkable

group of stars in the hinder part of the Great Bear being within 40° of the north pole, never sinks below the horizon of any place in a higher n. latitude than 40° , a peculiarity alluded to by Ovid in his *Metamorphoses*. It contains a considerable number of stars, 17 of which are easily visible by the naked eye; but of these, only one (α) is of the first magnitude, two (β and γ) of the second, and eight (among whom are δ , ϵ , ζ , and η) of the third. Of the seven stars constituting "the Plow," α and β are known as "the Pointers," from their use in detecting the *pole-star* (q.v.). A line drawn from the pole-star through η of the Great Bear, and produced its own length, passes close to the star Arcturus of the first magnitude.—*Ursa Minor* is less prominent in the heavens. It was also *Arktos* and *Hamara* among the Greeks, and *Aretus* and *Ursa* among the Romans, from the close resemblance of its chief star-group to that of *Ursa Major*; but was, besides, distinctively denominated *Kynosoura* or *Kynosouris*, and *Cynosura*, "the Dog's Tail," from the circular sweep, resembling the curl of a dog's tail, formed by three of the stars in it. The star α in the extremity of the tail of the Little Bear, at present the pole-star (q.v.), is the brightest in the constellation, though only of the third magnitude.

According to the later mythical stories of the Greeks, *Ursa Major* was the metamorphosis of Callisto, one of Diana's nymphs, who, having violated her vow, and being transformed by her indignant mistress into a bear, was slain by her son Arcas, and afterward transferred to the heavens as a constellation by Jupiter; Arcas being at the same time metamorphosed into Boötes, the Arctophylax, "Bear-warden," of the Greeks. According to the other but less common legend, which represents the seven stars of *Ursa Major* as the oxen of Icarus, Arctophylax became Boötes, "the Ox-driver."

URSIDÆ. See BEAR.

URSON, *Erythizon dorsatum*, a quadruped nearly allied to the porcupine, and often called the Canada porcupine. The genus *erythizon* differs from *hystrix* (porcupine) in the flatter head, the shorter and not convex muzzle, the longer tail, and in having the quills short and half hidden in the hair. The urson is about the size of a small hare. It is found as far s. as Virginia and Kentucky, and as far n. as lat. 67° . Its quills are dyed by the Indian women, and worked into ornamental articles of various kinds.

URSULA, St., a celebrated saint and martyr of the Roman calendar, especially honored in Germany, and particularly at Cologne, which is the reputed place of her martyrdom. The legend substantially, in its present form, can be traced as far back as the end of the 11th or beginning of the 12th c., as it is found in the revised edition of the Chronicle of Siebert of Gemblours (Pertz, *Rerum Germanicarum Scriptores*, viii. 310), which was made between 1106 and 1111. According to this writer, Ursula was the daughter of the British king Deonatus; and on account of her distinguished beauty, was sought in marriage by the son of a heathen prince who was originally named Holofernes, but afterward, when a christian, was called Ætherius. Her father was forced to yield to the demand; but Ursula made it a condition that her suitor should become a Christian, and that she should be allowed a space of three years, during which she proposed, in company with her maidens, to each of whom should be assigned a thousand companions, and a three-oared galley to convey them, to make a voyage of pious pilgrimage. The conditions were accepted; the maidens, to the number of 11,000, were collected from all parts of the world; and at length the expedition set sail from the British coast. Arriving at the mouth of the Rhine, they sailed up the river to Cologne, and thence upward to Basel, where, leaving their galleys, they proceeded by land to visit the tombs of the apostles at Rome. This pilgrimage accomplished, they descended the river to Cologne, which, however, had meanwhile fallen into the hands of an army of Hunnish invaders, under the headship of a chief, who, although not named, is plainly the Attila of history. Landing at Cologne in ignorant security, the pious virgins fell into the hands of these barbarous heathens, by whom they were all put to the sword with the exception of Ursula, who, for her beauty's sake, was reserved as a prize for the chief. She, too, however, as well as another maiden who had at first concealed herself in terror, demanded to join her companions in martyrdom; and thus the full number of 11,000 victims was made up. Heaven, however, interposed. A host of angel warriors smote the cruel Huns; Cologne was again set free; and in gratitude to their martyred intercessors, the citizens erected a church on the site still occupied by the church now known under the name of St. Ursula. Such is the legend as told by Siebert, although it has undergone some modifications in later hands. The improbabilities and anachronisms of this legend were early observed; and it became the subject of an animated controversy soon after the reformation. On the one hand, the centuriators of Magdeburg exposed its weak points with unsparing severity; on the other, a Jesuit father, Crombach, devoted an entire folio volume to the vindication of the substantial truthfulness of the narrative. Many suggestions have been offered as explanations of its most startling improbability—viz., the alleged number of the martyred victims, 11,000. One of these is, that this belief arose from the name of a virgin who was really the companion of Ursula's martyrdom—*Undecimilla*. The record of the martyrdom in the calendar thus being "Ursula et Undecimilla VV.", "Ursula and Undecimilla Virgins," was easily mistaken for "Ursula et Undecim millia VV.," "Ursula and eleven thousand virgins."

Secular inquirers into the origin of the Ursula legend deny that it has the slightest foundation in any historical facts. They find the first traces of the reverencing of these

virgins in martyrologies and missals of the latter half of the 9th c., in which mention is made either of a very small number of virgins whose names are given, or a larger indefinite number without names. In one metrical martyrology of this period, by Wandalbert, a monk of Prüm, they are already spoken of as thousands; and after the end of the 9th c. the number of 11,000 is found in the calendars. The name of Ursula, however, does not occur till after the 10th c.; and it was not till the 12th c. that the reverence for Ursula became predominant over that of the associate virgins. With the 12th c. begins the discovery of the sacred bones. The *ager Ursulinus* was revealed by a vision in 1106; and at first, single skeletons were raised with the greatest solemnity; but beginning with 1155, the digging up of the field was carried on systematically for nine years, in the course of which thousands of skeletons were found, male as well as female, besides coffins, stone tablets with inscriptions, and the like. What the several relics were was revealed to a nun named Elizabeth, then living in the diocese of Trier, to whom the holy martyrs appeared in visions. In this way were identified a pope of the name of Cyriacus, an archbishop, several cardinals, bishops, and priests, and also Ætherius, Ursula's bridegroom, along with whose title the cross, a crown, and other royal insignia were represented. It was also explained how all these men came to be in the company of the pious virgins. Even the children's bones found among the others were accounted for by revelations made forty years later to an abbot at Arnsberg, which confirmed and supplemented those of Elizabeth. The numerous human remains found in the Ursulan field at the north side of the city have been accounted for by antiquaries, by making it out to have been the burying-ground of the ancient Roman *Colonia Agrippina*. The origin of the legend is accounted for by Schade in his work *Die Saga von der Heiligen Ursula* (Han. 1854), on the theory that it is a Christianized relic of old German paganism, in which Ursula has taken the place of the ancient goddess worshiped by the Scandinavians as Freyja (q.v.), and still remembered by the German people under the names of Berchta (q.v.), Hulda (q.v.), etc., and in Sweden by the very title of "Old Urschel."

But without pursuing further this curious inquiry, it will be enough to say, as concerns the Roman Catholic view of the matter, that while the most learned of the Catholic hagiographers, putting aside the idea of a directly and intentionally invented narrative, have traced the origin of the legend to a real historical massacre of a very large number of Christian maidens, which took place during the invasion of Attila, and soon after the celebrated battle of Chalons in 451, all the modern writers of that church are agreed in regarding the details of the narrative, the number, the pilgrimage to Rome, the interposition of the heavenly host, etc., as legendary embellishments of the mediæval chroniclers.—See, for the full exposition and vindication of the history, Crompton, *Ursula Vindicata* (fol. Colonia, 1647); and for a more critical exposition of the historical foundations on which it rests, Binterim's *Calendarium Eccles. Germ. Colon.* (1824); *Zeitschrift für Phil. u. Kathol. Theologie* (1850); Kellerhoven, *La Légende de Sainte-Ursula* (1862).

URSULINES, a religious order of females in the Roman Catholic church, taking their name from the saint and martyr who forms the subject of the above article. They take their origin from Angela Merici, a saint of the modern church, b. according to the more received account, at Desenzano, in the latter part of the 15th century. She formed at Brescia an association of young females who bound themselves by a vow to labor for the tending of the sick, the instruction of children, the relief of poverty, and other such works of charity. After a time, a rule, in twenty-five chapters, was projected by Angela, and finally approved by the bishop of Brescia, cardinal Francis Cornaro. Angela was herself chosen as the first superior, in the year 1537, the community even at that time numbering as many as 76 sisters. During the lifetime of Angela, and for more than twenty years after her death, which occurred in 1540, the congregation was confined to the diocese of Brescia; but in the year 1565, a house was opened at Cremona; and with the approval of popes Gregory XIII. and Clement VIII., it was spread over many dioceses of Italy. It was warmly encouraged by St. Charles Borromeo, and at his death there were no fewer than 28 convents of the order in his diocese, comprising above 600 nuns. Soon afterward, it was established in France, where one of its most distinguished members was the celebrated sister, Madeleine de St. Beuve. It was in France that the sisters, although from the beginning they had been engaged in teaching, first formally added to their religious vows that fourth vow to devote themselves to the instruction of female children, which has since formed the great characteristic of the order. They were introduced into Savoy by St. Francis de Sales in 1635; and in 1639, a convent was opened in Quebec, in Canada. About the same time, they were introduced into Germany—at Vienna in 1660, and at Freiburg, Kitzingen, and Prague soon afterward—where they have continued to teach with great success; and their convents in various parts of Germany, but especially in Austria, at present number 36. The Ursuline sisters have several educational establishments in Ireland, in England, and in the United States, and may fairly claim the merit of having been mainly instrumental in maintaining among Catholics the education of female youth of the higher order through the 17th and 18th centuries. They have found many competitors among the younger sisterhoods of modern times.—See *Journal des Illustres Religieuses de l'Ordre des de Ste. Ursule*, 4 vols. 4to (1690); *Chroniques de l'Ordre des Ursulines*, 2 vols. (Paris, 1676).

URTICA'CEÆ, or **URTIC'CEÆ**, a natural order of exogenous plants, consisting of trees, shrubs, and herbs, natives of almost all parts of the world. According to many botanists, the order includes about 600 known species; while others, restricting it by separating from it several distinct orders, reduce it to about half that number, of which the common nettle may be regarded as the type. The leaves of all are alternate, furnished with stipules, and generally very rough, sometimes with stinging hairs. The inflorescence is various; the perianth usually divided, but sometimes a mere scale; the stamens inserted into the perianth, equal in number to its segments, when it is divided, and inserted at their base; the ovary free, one-celled, containing a single ovule. The fruit is a kind of nut, surrounded by the persistent and sometimes fleshy perianth, sometimes winged; and sometimes the fruits are variously aggregated. Under this description are comprehended *cannabinaceæ* (q.v.), *ulmaceæ* (q.v.), *moraceæ* (q.v.), and *artocarpaceæ* (q.v.), as well as the restricted *urticaceæ*, which have filaments curved in bud, and turning backward elastically when the anthers are bursting, the fruit an unopening nut. The juice of the restricted *urticaceæ* is watery, not milky; the wood in the arboreous or shrubby species, which are all tropical, is remarkably soft and light. The fiber of the bark of some is valuable. It is among the restricted *urticaceæ* that species covered with stinging hairs are found. See *BOEHMERIA*, *NETTLE*, *NEILGHERRY NETTLE*, and *PELLITORY*.

URTICA'RIA. See NETTLE-RASH.

URUGUAY', otherwise **BANDA ORIENTAL DEL URUGUAY**—i. e., "the eastern bank of the Uruguay," is a small South American state, bounded on the n. and n.e. by Brazil, on the e. and s.e. by the Atlantic, on the s. by the Rio de la Plata, and on the w. by the Uruguay. It is nearly square in shape, and its greatest length and its greatest breadth are over 300 miles. Area, 71,752 sq.m.; pop. '76, 445,000. The interior of Uruguay is very imperfectly known. In the south all along the Rio de la Plata, and as far north as the Rio Negro, the country is a sort of terraced upland, with a bold, broken, treeless coast-line, possessing some excellent harborage; while the shores facing the Atlantic are low and sandy. Further east, rises a woody plateau; but high, bare, grassy plains, traversed by ranges of low hills, seem to be the predominant feature. The climate is mild; rain falls pretty copiously in winter, but is rare in summer. The most important rivers are the Rio Negro, the Daiman, the Arapey, the Yaguaron, and the Sebollati. Agriculture is in a very backward state, although the soil is naturally rich. Small quantities of wheat, maize, barley, rice, peas, beans, flax, hemp, and cotton are raised, and fruit trees thrive well; but the wealth of the country consists in its splendid pasture, which supports great herds of horned cattle, horses, and sheep. The wool of these Uruguayan sheep is of a superior quality. The wild animals embrace the tapir, deer, ounce, monkey, paca, rabbit, and fox; and large packs of wild dogs infest the plains. Uruguay has almost no manufactures, and very little commerce, as yet. The chief exports are jerked and salted beef, tallow, hides, horn, and hair; and the chief imports woolen goods, household furniture of all kinds, sugar, cordage, agricultural implements, timber, etc. The value of the imports in 1877 amounted to about £2,800,000; and that of the exports to about £3,000,000. Nearly all the imports and exports pass through Monte Video (q.v.), the capital. The towns of note besides the capital are Maldonado and Colonia del Santo Sacramento.

Uruguay was originally colonized by Spanish settlers from Buenos Ayres, on the other side of the La Plata; but the territory which forms the natural limit of Brazil on the south was claimed by Portugal, and a war ensued between the two nations for its possession which terminated in favor of Spain. Uruguay was now attached to the viceroyalty of Buenos Ayres, and received the name of *Banda Oriental*—i.e., as has been explained above, the country on the eastern bank of the Uruguay. Its independence was secured by treaty in 1828, when it took the title of *Republica del Uruguay Oriental*; but, like most of the South American republics, it has suffered incessantly from internal discords.

URUGUAY RIVER, in South America, rises in the province of Santa Catharina, Brazil; after a course of about 70 m. n., increased by the Pelotas, the Pepiri-Guaçu, and other streams, turns s.; flows between the Argentine provinces of Entre-Rios and Corrientes, and the Brazilian province of São Pedro; is joined by the Ibicui, by the Quaraim, which is 160 m. long, and separates Uruguay and Brazil. At this point the Uruguay is 1500 yards wide; and from here to its mouth is the boundary line between Uruguay and the Argentine republic. It is joined by numerous tributaries, of which the Rio Negro is the largest, and in lat. 34° unites with the Parana to form the Plata. It is navigable for flat-bottomed steamers for about 600 m., and has a total course of about 1000 miles.

URUMEYAH, a t. of Persia, situated 10 m. w. of the lake, in a wide and fertile plain, is surrounded with a mud wall and moat, but has no gates. Extensive fruit and vegetable gardens are situated both within and without the walls. The houses of the better classes are lofty, spacious, and sumptuously furnished; and many of those of the poorer classes are tastefully adorned with flowers and vines. Urumeyah is the residence of a Persian governor, of a Nestorian bishop, and of an American mission; it has a pop. of about 50,000, a large number of whom are Nestorian Christians and Jews. Urumeyah was anciently known as *Thabarma*, or *Thebarmæ*, and was held in great veneration by

the Persians, by reason of the legend which fixed it as the birth-place of Zoroaster (q. v.). In 624 A.D. the town, including a magnificent fire-temple, was destroyed by the emperor Heraclius.

URUMEYAH, **URUMIJAH**, **URMEA**, LAKE, called also the *lake of Maragha* (q. v.), *lake of Tabriz*, and by the neighboring peoples *Kapouta* (Armen. *kapoit*, blue), the principal lake of Persia, is situated in the west of Azerbaijan, about 34 m. w. from Tabriz. The lake, which is 4,320 ft. above sea-level, is about 80 m. in length from north to south, has an average width of 25 m., and contains more than 1900 English sq. miles. It is one of that class of lakes which receive but do not emit streams; and despite the fact that its feeders include such rivers as the Aji-su, 180 m. long; the Jage-tu, 140 m. long; and the Ta-tu, 90 m. long, it has only an average depth of 12 feet. The water is largely impregnated with saline substances (according to one authority, the salts constitute 25 per cent of the whole weight), and is so heavy as to be little ruffled by the strongest wind. No fish or mollusca are found in it. Six large isles, and a multitude of islets and rocks, show themselves just above its surface, being mostly grouped together near its center. The lake is fast drying up, leaving a gradually widening beach of thick saline incrustation, which supplies with salt the whole of Kurdistan. The lake was known in ancient times as *Matiana*, or *Mantiana*.

URUMTSI, a city at the base of the Thian-Shan mountains, in the Chinese province of Urumsit in central Asia: pop. about 150,000. It was formerly the center of a great trade with the surrounding country, with Russia, Persia, etc. Its commercial importance was ruined by the Dungans, a Mussulman nation in n. China, who revolted in 1862, on account of excessive taxation, and entered s. Mongolia, taking possession of Urumsit.

URUS, a great animal of the ox kind, which anciently inhabited the forests of central Europe, and is described by Cæsar (*Bell. Gall.* vi. 28) as common in the great Hercynian forest; as scarcely less than an elephant in size—an evident exaggeration—but otherwise resembling an ox, of great strength, of great swiftness, and of great fierceness. He mentions that the horns were very different from those of the oxen of Italy—large, spreading, and sharp. This character is found in the wild cattle of Chillingham and other parks in Britain, and in some of the Highland breeds of oxen; and the probability seems to be that the urus was the wild original of the domestic ox, and not a bison, nor any now extinct species, although some authors maintain a contrary opinion. See a monograph by Storer on the *Wild Cattle of Great Britain* (1879).

URVASÎ. See **PURŪRAVAS**.

USAGE, in law, is generally employed to denote that long and uniform practice in mercantile transactions or trade, which will be regarded by courts in construing the meaning of contracts. To have such weight the usage must be uniform, certain, reasonable, and not contrary to law; but need not be "immemorial." By the aid of the principles of usage, words and expressions of doubtful meaning may often be explained, but courts are very cautious in accepting the existence of an alleged usage.

USBEGS, or **USBEKS**, a people of Turkish race, who, at the close of the 15th c. of the Christian era, invaded and conquered the numerous principalities into which Turkistan was at that time divided, and have ever since maintained dominion over the country. At the present day they are for the most part a settled people, occupying themselves in the cultivation of the soil and in trading, and are scattered over Russian, Independent, and Chinese Turkistan. The most probable supposition regarding their origin is that they immigrated from Kiptchak (q. v.), and assumed the name of Usbegs, from Usbeg, one of their chiefs. The Usbegs of Khiva, Bokhara, Khokan, and of Chinese Turkistan differ from each other in language, manners, and customs. Those of Khiva speak a dialect of the Turkish, are honest and generous, and destitute of the treachery and duplicity which are so characteristic of oriental civilization, are passionately fond of music and poetry, and though zealous Mohammedans, still retain many of their ancient heathen usages. They pride themselves much on the purity of their Usbeg descent, but most of them show evident traces of an admixture of Iranian blood. The Usbegs of Bokhara have become largely mingled with the Tajiks, and have consequently lost many of their national characteristics. Those of Khokan are very different from the two previous, and are as much Kirghis, Kiptchaks, and Kalmucks as they are Usbegs; the fact that the Usbegs have been the dominant race in Turkistan for three centuries and a half, having given the name such a prestige of nobility and good breeding, that it is generally assumed by such members of other races as settle in cities.

USE AND OCCUPATION is the technical name given in the law of England to the beneficial enjoyment of premises by a tenant, who occupies the real property of another, such as houses and farms. In all cases where a person has had use and occupation of another's premises, with the assent of the owner, an action lies for the value thereof, which value corresponds to rent under an ordinary lease. Hence, where it is doubtful whether there has been a valid lease executed between the parties, the landlord can nevertheless recover rent under the head of use and occupation.

USEDOM, an island belonging to Prussia, lies at the mouth of the Oder, and together with the island of Wolln, shuts off the Stettiner Haff from the Baltic. It is of very

irregular shape, being much indented by branches of the Haff, is 34 m. in extreme length, and 15 m. broad. Area about 148 sq. miles. On its n.e. side is the port of Swinemünde (q.v.); on the s. side is the small town of Usedom, with about 1800 inhabitants.

USES, in the law of England, is the old name for trusts, which has superseded the other in most respects. Uses and trusts correspond to the *fidei commissum* of the Roman law. A use was a confidence reposed in another who was tenant of the land, or *terre-tenant*, that he should dispose of the land according to the intention of the *cestui que use*, or him to whose use it was granted, and suffer him to take the profits. See **TRUST**.

USH'ANT (Fr. *Ouessant*), an island in the Atlantic ocean, belongs to France, and is included in the dep. of Finisterre, from the w. coast of which it is distant about 17 miles. It is the largest of a small group of islets called the *Iles d'Ouessant*, has an area of 7 sq. m., and contains about 2,400 souls. The coasts are escarped and difficult of access; the soil is fertile. The inhabitants are employed in fishing, and in rearing cattle and horses.

USHAS (from the Sanskrit *uśh*, "to shine, to burn," and kindred with the Greek *ēōs* or *heōs*, and the Latin *aurora*), "the dawn," is one of the female deities of the Vedic religion of India (see **INDIA**, sec. *Religion*), and among these is invoked with special predilection by the poets of the R'igveda hymns. The invigorating influence which the dawn exercises on body and mind, and the luminous and other phenomena connected with the beginning of the day, form the subject of some of the best portions of Vedic poetry; and out of them Ushas arises as one of the most pleasing goddesses of the ancient Hindu pantheon. She is invoked as "the affluent," as "the giver of food," and "the bringer of opulence;" she is asked to bestow on the pious "riches with horses and cattle," "posterity and troops of slaves;" and she is praised for the many boons she has showered on the worshippers who were liberal to her. She is the goddess "endowed with an excellent intellect," and the "truthful," or fulfiller of her promises. "She animates the diligent;" when she appears, "bipeds and quadrupeds (are in motion)," "the winged birds flock around from the boundaries of the sky," and "men who have to earn their bread quit their homes." She rides in a "golden chariot," which is "ample and beautiful;" and the Sanskrit word *go* meaning a cow (or, as a masculine, an ox), and also a ray of light, she is not only "the mother of the rays of light," or attended by them, and rays of light are her banner, but her chariot is drawn by "ruddy *kine*," or, as they are sometimes called, "ruddy oxen." Less frequently she is spoken of as traveling with horses; for the horse, as a symbol of light, is more especially appropriated to the god of the sun. The relation of Ushas to other Vedic deities is of a twofold, a physical and a ritual, character, inasmuch as the phenomena of dawn are connected with other phenomena of nature, and as certain religious ceremonies are performed at daybreak. On these grounds, she is frequently addressed as "the daughter of heaven;" and when her "parents" are spoken of, the commentator explains this word as implying "heaven and earth." She is further called the daughter of night (night being the precursor of the dawn); but, on other occasions, she is also spoken of as having night for her sister. She is, besides, the sister of the two luminous deities *Bhaga* and *Varun'a*, and the faithful wife of *Surya*, the sun. According to an old commentator (*Yaska*), she would in one passage of the R'igveda also be the deity "who has the sun for her child," "either because the sun is her companion, or because he absorbs the moisture (i.e., the frost);" but as *ruśadvatsā*, the word, so interpreted, admits also of another rendering, it is doubtful whether she bears this epithet, the more so as in another passage the sun is said to follow Ushas as a man follows a woman. The *As'vins* being the luminous twin-gods, who probably represent the transition from darkness to light, and therefore that intermingling of both which becomes inseparable (see John Muir's "Contribution to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society*, new series, vol. ii., 1866), Ushas is called their "friend"—according to *Sāyan'a*, also their sister; she "follows their luster," and "awakes" them to partake of the soma prepared for them; and in their turn they are asked "to unite with the dawn." Another god, who originally on physical grounds is associated with Ushas, is *Indra* (q.v.), the ruler of the bright firmament. He "generates (i.e., causes to appear) sun and dawn," and "appoints them to their office," which is that of dispelling darkness; but though, "when (in the morning), desiring (the soma), he honors the dawn," his ascendancy during the day becomes fatal to her; for then "he slays her," "breaks her chariot;" and "her shattered chariot reposing on (the banks of) the river *Vipās*, she departs from afar." Most of these deities become, in consequence, associated with Ushas also as sharers in certain sacrifices which are offered to her; and besides these, *Agni*, the god of fire, who carries the offerings to the gods, and *Soma* (q.v.) Like many of the most poetical deities of the Vedic creed, also Ushas is excluded from the Hindu pantheon of the classical period. Her place is there taken by *Arun'a* (the ruddy), whom the epic poems and the *Purāṇas* make the son of the patriarch *Kas'yapa* and his wife *Vinatā*, and the younger brother of *Garud'a*, the bird-vehicle of *Vishnu*. According to the *Mahābhārata*, he was appointed by the gods to the office of charioteer of the sun, in order to intercept his fiery heat, when the sun, angry with the gods for being exposed to the enmity of *Rāhu* (q.v.), it was feared, would consume the world. Where repre-

sented, *Arun'a* is therefore seated before the sun on his chariot, driving his horses; but as the legends deprive him of his legs, his body is seen perfect to his knees only.

USHER, JAMES, Archbishop of Armagh, and by common consent the most learned prelate that ever adorned the Irish Protestant church, belonged to one of the oldest Anglo-Irish families, and was born in Dublin, Jan. 4, 1580. His father, Arnold Usher, one of the clerks in chancery, was a gentleman of good estate, and his uncle, Henry Usher, preceded him in the archbishopric of Armagh. At the age of 13 he entered Dublin college, where his predilection for history soon revealed itself. Having resolved to devote himself to the service of the church, he proceeded, after the solid fashion of the times, to read up the entire literature of ecclesiastical antiquity—a task which occupied him from his 20th to his 38th year! In 1601, he was ordained deacon and priest, and was shortly after appointed preacher of Christ church, Dublin. In 1607, he was chosen to the chair of divinity, a post which he held for 13 years. In 1609, he made one of his numerous visits to England, in the course of which he made the acquaintance of the most distinguished scholars of the age. In 1613, his first publication appeared, entitled *De Ecclesiarum Christianarum Successione et Statu*, which was designed as a continuation of bishop Jewel's *Apology*. The work was divided into three parts, of which only the first, reaching to the period of Hildebrand, and part of the second, were finished. In 1615, he was appointed, by a convocation of the clergy held at Dublin, to draw up a series of articles (the number amounted to 104) relating to the doctrine and discipline of the Irish Protestant church, in which the doctrines of predestination and reprobation (of which Usher was an unflinching apologist) found prominence. These and other views, such as, that bishops were not a different order from presbyters, that the Sabbath should be strictly enforced, that no toleration should be granted to Catholics, laid him open to the charge of Puritanism; but as his loyalty to the principle of monarchy was undoubted, he suffered no diminution of the royal favor; on the contrary, king James promoted him to the bishopric of Meath in 1620; and in 1623, constituted him a privy-councilor of Ireland. Two years later, he was raised to the highest ecclesiastical dignity in the kingdom, the archbishopric of Armagh, and in his official capacity "vigorously" opposed the toleration of popery and the spread of Arminianism. In 1632, Usher published *Veterum Epistolarum Hibernicarum Sylloge*, a collection of letters out of several ancient MSS., concerning the state of the Irish church from 592 to 1180; in 1635, *Emmanuel, or a Treatise on the Incarnation of the Son of God*; in 1639, *Britannicarum Ecclesiarum Antiquitates*, which is said to contain "a most exact account of the British church; from the first planting of Christianity, twenty years after our Saviour's crucifixion, down, both in Britain and Ireland, to the end of the 7th c.;" in 1641, *The Judgment of Dr. Reynolds concerning the Original of Episcopacy defended; The Original of Bishops; The Power of the Prince and the Obedience of the Subject*, etc. When the civil war broke out, Usher, who was in England at the time, espoused the side of the king, refused to sit, when nominated, among the assembly of divines at Westminster, and made himself very obnoxious to the parliament by the sermons which he preached at Oxford. When the fortunes of the king began to decline, Usher left Oxford; his property and revenues in Ireland were seized, and after a residence in Wales and elsewhere, he came to London in 1647, where, in spite of his royalist sympathies, he was chosen by the benchers preacher of Lincoln's Inn, a post which he retained till his death, March 21, 1656. Cromwell, who had a great respect for his learning, ordered his remains to be interred with great magnificence in Erasmus's chapel in Westminster abbey. Usher was a man of undoubted ability and of enormous erudition, pious and free from worldly ambition; but he lacked force of character, real insight and intellectual power, hence, though pronounced by Dr. Johnson "the greatest luminary of the Irish church," he exercised less influence over the course of contemporary events than the humblest of Cromwell's Ironsides. Nor can it be shown that posterity is very deeply indebted to him for more than the example of a virtuous and studious life. Usher's chief works, besides those already mentioned, are his edition (1644) of the *Epistolæ of Polycarp and Ignatius*; his treatise *De Romanæ Ecclesiæ Symbolo* (1647); *Dissertatio de Macedonum et Asianorum Anno Solari* (1648); and *Annals of the Old Testament* (1654) a chronological work. After his death, there were published (from his numerous MSS.), *Chronologia Sacra*, etc. (Oxford, 1660), by which and his *Annals* he is most widely known; a volume of *Sermons*; *Historia Dogmatica Controversiæ inter Orthodoxos et Pontificios de Scripturis et Sacris Vernaculis* (Lond. 1690); *A Collection of three hundred Letters written to James Usher, Lord Archbishop of Armagh*, to which is prefixed a life of the archbishop by his chaplain, Richard Parr, D.D. (Lond. 1686). A collected edition of Usher's works, in 16 vols., with a new biography, was published at Dublin in 1841, by Dr. Elrington.

USHER OF THE BLACK ROD, one of the officers of the order of the garter (q.v.), coeval with the institution of the order, and originally called "Hostiarius capelle regis infra castrum de Windsor." The rod from which his title is derived is of ebony, mounted with gold $3\frac{1}{2}$ ft. in length, having at the top a lion sejant, holding before him in his forepaws a gold shield charged with the royal cipher in gold surrounded with the garter. He has a mantle like that of garter king of arms, and his badge is a gold knot surrounded with the garter, and ensigned with the royal crown. It is the practice to unite this office with that of the king's first gentleman usher daily waiter at court, who is one of the

chief officers of the house of lords. In this capacity it is one of the functions of the gentleman usher of the black rod, or of his deputy, who is known as the yeoman-usher of the black rod, to desire the attendance of the commons in the house of lords when the royal assent is to be given to bills by the sovereign or lords commissioners; also to execute orders of commitment for breach of privilege and contempt, and to assist at the introduction of peers, and other ceremonies of the upper house.

USHER OF THE GREEN ROD, one of the officers of the order of the Thistle (q.v.), whose duties consist in attendance on the sovereign and knights when assembled in chapter, and at other solemnities of the order. The rod from which the title is taken is of green enamel, three feet in length, ornamented with gold, having on the top a unicorn of silver, holding before him an escutcheon charged with the cross of St. Andrew.

USKUP, or *SCOPIA*, a t. of European Turkey, in Monastir, on the Vardar, 120 m. n.w. of Salonica. The town, which is built on lilly ground, contains 16 mosques, with black domes and minarets, interspersed among fruit trees. Here are the ruins of an ancient Roman aqueduct, consisting of 55 arches. Leather is manufactured. Pop. estimated at 10,000.

USNEA, a genus of lichens, having a much-branched thallus, with an elastic thread in the center. Some of the species are natives of Britain. They grow on trees, and are generally pendulous. They contain the vegetable principle called *usnine*, which, however, is also found in many other lichens. They are sometimes used in dyeing, like archil and cudbear. From their appearance, many of the species of usnea receive the popular name of **BEARD-MOSS**.

USTILA GO. See **SMUT**.

USUFRUCT, in Scotch law, is adopted from the Roman law, to denominate one of the three personal servitudes, which were use, usufruct, and habitation. Usufruct is better known under the name of life-rent (q.v.), or estate for life (q.v.).

USURY. See **INTEREST**.

UTAH (named from an Indian tribe *Utah*, or *Yuta* [Utes?], dwellers in mountains), a territory of the U. S., lying between lat. 37°-45° n. and long. 109°-114° w., containing 84,476 sq. m., bounded n. by Idaho and Wyoming; e. by Colorado; s. by Arizona, and w. by Nevada. Its chief town and capital is Salt Lake City (q.v.). Utah is an immense basin, 4,000 to 5,000 feet above the level of the sea, surrounded by mountains, which at some points reach the altitude of 8,000 to 13,000 feet. Excepting the Green and Grand rivers, in the e. and s.e., Santa Clara river in the s.w., and the head branches of the Colorado, which flows through a cañon 1200 feet deep, its rivers empty into the Great Salt lake, in the northern center of the territory; and similar salt lakes or inland seas. This great valley, which includes the new territory of Nevada, is formed by a branch of the Rocky mountains on the e., and the Sierra Nevada on the west. The formations are primitive and metamorphic, with secondary basins 15. or 20 m. wide. The principal mountains lying within the territory are the Humboldt range, 6,600 ft. high, in the w., and the Wahsatch in the s., 12,000 feet. There are numerous lakes, many thermal springs, and salt springs. The rocks are mostly primitive, and rich in granite, jasper, syenite, porphyry, and quartzes, showing everywhere evidences of volcanic action. There are also ridges of carboniferous limestone containing calcareous spar; and near Salt Lake City occur boulders of serpentine, fine gray granite, sandstones, conglomerates, talcose and striated slates, gypsum, limestone, and marble of every hue in large masses. Iron is abundant; and there have been found gold, silver, copper, zinc, lead, inexhaustible quantities of bituminous coal, sulphur, alum, borax, and petroleum. Among the animals are the antelope, elk, deer, Rocky mountain sheep, cougar, catamount, wolves, foxes, beavers, porcupines; quail, grouse, swans, wild geese, pelicans, ducks; perch, pike; bass, and salmon-trout of 30 lbs. weight. Generally, vegetation is not luxuriant, and timber, except pines and firs in the mountains, scarce. The country has good grass for grazing, and some wild fruits. The climate is bleak and changeable, with deep snows and intense cold in winter, and heats in summer, accompanied with storms and thunder and dust. The soil, as a whole, may be described as barren, with spots of remarkable fertility, producing 60 to 100 bushels of grain to the acre. Much of the soil is strongly alkaline. The chief crops are wheat, oats, barley, maize, buckwheat, flax, hemp, fruits. Cattle and sheep are abundant. The chief manufactures are those required in a new country, as farming-implements, furniture, carriages, woolen goods, leather, steam-engines, and machinery and cutlery, in which are employed a large number of skilled English artisans.

The population of Utah consists almost entirely of Mormons (q.v.), governed by a hierarchy of which Brigham Young (q.v.) was long the head. In 1860, the pop. was 40,295; in 1870, 86,786 (besides Indians). Most of the Mormons come from Great Britain, and many are from Sweden and the n. of Europe. Latterly there has been considerable increase by immigration of the "Gentiles" or non-Mormon population. Provision has been made for education in the foundation of the university of the state of Deseret—the name under which they propose to come into the American union—a free academy, and common schools. In 1870 there were ten newspapers. There is a United States territorial government, with governor, secretary, marshal, and judges, appointed

by the president, and a legislative assembly, elected by the people. In 1875, there were 504 miles of railway, the Central Pacific crossing northern Utah. The taxable property, real and personal, was in 1877 assessed at \$22,553,660. The Shoshone, Snake, and Yuta Indians number about 1200.

UTAH (*ante*) was originally a part of Upper California, and was acquired by the United States from Mexico by treaty in 1848 at the conclusion of the war with that country. The Mormons, driven from Illinois and Missouri, emigrated hither in 1847-48, and established themselves in what was then almost an unknown region, which they named Deseret. Under the superintendence of their high-priest, Brigham Young, Salt Lake City was soon founded; and in 1850 a territorial government was formed, over which he was appointed governor. In 1857, however, he set at defiance the federal authority, and it became necessary for the U. S. government to send an armed force into the territory to compel obedience. Since then there has always existed more or less difficulty in controlling the territory. In 1862 the Mormons formed a state constitution, and demanded admission to the union as the "state of Deseret." The refusal caused further unpleasant relations. During the past 10 years the opening of several mines in the territory has brought about the emigration of many "Gentiles" to Salt Lake City and the surrounding region, which has to some extent worked a change in Mormon authority. Of the population in 1870, 56,084 were natives of the United States, and 30,702 foreign born; 44,121 males, and 42,665 females. About 41,000 were born in the territory, 2,247 in New York, 2,105 in Illinois, 1492 in Iowa, 1315 in Pennsylvania, 1133 in Ohio, and 908 in Missouri. Of the foreigners, 16,073 were English, 502 Irish, 2,391 Scotch, 1783 Welsh, 4,957 from Denmark, 1790 from Sweden, 613 from Norway, and 509 from Switzerland. The number of families was 17,210, with an average of 5.04 persons to each; and the number of dwellings was 18,290, with an average of 4.75 persons to each. About 10,428 persons were engaged in agriculture, 5,317 in professional and personal services, 1665 in trade and transportation, and 4,107 in manufactures and mining. By the census of 1880 the total population of the territory was 143,907, showing an increase since 1870 of 57,121. The natives numbered 99,974, the foreigners, 43,933; males 74,471, and females 69,436.

The greater part of the territory, it is asserted, is hopelessly sterile; yet the Mormon population has thriven almost entirely by agricultural pursuits. Wherever irrigation can be applied the soil usually proves rich in all fertile qualities. The chief agricultural localities are the Malade valley; Cache valley, watered by Bear river; Weber valley; Salt Lake valley, as the tract along the s.e. shore of Great Salt lake is called; Jordan valley; Tooele valley, w. of the Jordan; the basin of Utah lake; Rush valley, w. of Utah lake; San Pete valley; Sevier valley; and Rio Virgin valley. The region e. of the Wahsatch mountains is little known, but in the valleys of the Uintah and some other tributaries of the Colorado river there is considerable irrigated land. In 1870 there were 148,361 acres in farms, of which 118,755 were improved. The farm products were 543,-487 bushels of spring wheat, 14,986 of winter wheat, 1312 of rye, 95,557 of Indian corn, 65,650 of oats, 49,117 of barley, 178 of buckwheat, 9,291 of peas and beans, 323,808 of potatoes, 5 of grass-seed, 22 bales of cotton, 109,018 lbs. of wool, 310,335 of butter, 69,603 of cheese, 322 of hops, 10 of flax, 13 of wax, 575 of honey, 3,131 gallons of wine, 67,446 of sorghum molasses, and 27,305 tons of hay. The live stock included 14,281 horses, 2,879 mules and asses, 190,934 neat cattle, 59,672 sheep, and 3,150 swine. The number of manufacturing establishments in 1870 was 533, employing 1534 hands, and a capital of \$1,391,898; they paid \$395,365 in wages, used \$1,238,252 worth of raw material, and produced annually goods valued at \$2,343,019. At that date there were 6 mining establishments in the territory, which had about \$44,800 invested as capital, and were producing about \$14,900 yearly. At present, however, it is probable that the capital invested in mining operations amounts to more than \$4,000,000, and that the products are as much as \$7,000,000 annually. The principal mining districts are Parley's Park, Big Cottonwood, Little Cottonwood, and American Fork in the Wahsatch range; West Mountain or Bingham, Dry Cañon, Ophir, and Camp Floyd, in the Oquirrh range; Tintic and West Tintic in the Tintic mountains; and South Star, North Star, San Francisco, and Lincoln in the s.w. part of the territory. Gold, silver, and lead ores exist in large quantities, and the territory is richer in iron ores of all qualities than any other portion of the United States. In Iron county, within a distance of 10 m., there are 10 separate deposits or mountains of hematite and magnetite, estimated to contain about 130,000,000 tons of iron ore, averaging from 65 to 70 per cent of pure iron. Other deposits of large extent have also been found in the Castle valley region and in Cache, Box, Elder, Weber, and Davis counties in the n. part of the territory.

Communication with California and the east is obtained by way of the Union Pacific railroads, which meet at Ogden in the north. From this point the Utah Central railroad extends to Salt Lake City, whence the Utah Southern railroad runs s. to York, and the Utah Western w. to Lake Point. The Utah Northern railroad extends from Ogden to Franklin, Idaho; the American Fork railroad from American Fork e. to Deer creek; the Bingham Cañon railroad from Sandy on to Bingham Cañon; the Wahsatch and Jordan Valley railroad from Sandy to Fairfield; and the Summit County railroad from Echo to Coalville. These roads together have a mileage of about 500 miles. Many of

them are mining roads, running into the mountain cañons, and used chiefly to transport the ores.—Some of them were constructed, it is reported, at the low average cost of \$27,232 a mile, and made in 1875 net earnings of \$2,675 a mile. The business transactions of the territory sustain 3 national banks, with a capital of \$450,000, and an outstanding circulation of about \$400,000; and 6 private banks and banking-houses. The valuation of real estate in 1870 was estimated to be \$7,047,881: of personal estate, \$5,517,961; the true value of both together, \$16,159,995. The taxation at that time amounted to \$167,355, of which \$39,402 was for territorial, \$80,419 for county, and \$47,534 for city and town purposes. The assessed value in 1877 was \$22,553,660: the total receipts into the treasury for the two years ending Dec. 31, amounted to \$94,410, including \$532 on hand at the beginning of the period; the disbursements, \$94,325. The territory has no debt.

The common schools are under the management of a territorial superintendent, county superintendents, and district trustees. They are sustained by general appropriations, by local taxation, and by the assessment of rate-bills. For the year 1874 the receipts for school purposes were \$109,836, of which \$33,883 was from territorial and local taxation, and \$75,953 from rate-bills. The school population was 33,164, out of which 17,742 were enrolled, and 12,916 were reported in attendance. The number of school-houses was 260; average duration of school, 134 days, or about 6 months and 6 days; number of teachers employed, 398. Besides the common schools there were 12 private schools, which had 1264 pupils and 37 teachers; and the university of Deseret, at Salt Lake City, which has medical, collegiate, normal, and preparatory departments. The number of libraries in 1870 was 133, with 39,177 vols., of which 59, with 4,684 vols., were private. The number of newspapers and periodicals published in the territory is about 21, of which 5 are daily, 15 weekly, and 1 monthly. The church organizations in 1870 numbered 165, with 164 edifices, 86,110 sittings, and property valued at \$674,600. All excepting 5 of these organizations were Mormon. These were 2 Episcopal, 2 Methodist, and 1 Presbyterian.

The territorial government is organized on the plan of the other territories. The governor and secretary are appointed for four years by the president of the United States. The legislative assembly is composed of a council of 13 members, elected for two years, and a house of representatives of 26 members elected for one year. The judicial power is vested in a supreme court, consisting of a chief-justice and two associate justices (appointed by the president); and in district courts, probate courts, and the other usual minor courts. The territory, like the others, sends one delegate to congress, who has the right to speak, but not to vote. The constitution grants the right of suffrage to women.

UTAH, a co. in n. Utah, containing the Wahsatch range of mountains, the Oquirrh mountains, and Utah lake; 2,000 sq.m.; pop. '80, 17,918—12,949 of American birth, 27 colored. County seat, Provo city.

UTAH LAKE, in n. Utah, in Utah co.; 4,300 ft. above the level of the sea; 130 sq.m.; 25 m. long, 13 m. wide. It is a body of fresh water without islands, having the Wahsatch mountains on the e., the Oquirrh range 10 m. distant, and the Lake and Tintic mountains on the west. Its tributaries flow from the east. It is fed by Corn creek, Hobbie creek, the American fork, the Spanish fork, and Provo river. It has an outlet at the n. extremity by the river Jordan, 40 m. in length, leading from a body of fresh water to a salt lake. It abounds in water-fowl and various kinds of fish. Its e. shore is occupied by Mormon settlements.

UTAHIS, or **UTES**, a tribe of American Indians living in Utah, Nevada, Colorado, and New Mexico. They belong to the Shoshone family. Those bands living in Utah were originally friendly to the Mormons, but afterward became hostile. The most important bands are the Yampa, Mohuache, and Capote in New Mexico and Colorado, and the Pi-Utes, Sanpitches, and Pahlvants in Utah. The Capotes made a treaty in 1855. The Mohuaches would not help the Mormons fight the United States. In 1865 some of the bands made cession of large tracts of land, agreeing to go on reservation. Black Hawk, chief of the Pah-Utes, fought against the whites, aided by Sanpitch, chief of the Sanpitches, who was arrested, and afterward killed. In 1866 the Mohuaches were defeated by col. Alexander. Rich mineral deposits were afterward found on the Ute reservation in Colorado, and, in accordance with an act of congress in 1872, the reservation Indians ceded 4,000,000 acres. The number of the whole tribe is about 15,000.

UTERUS. See **WOMB**.

UTES. See **PI-UTES**.

UTICA, a city of New York, on the Mohawk river, at the junction of the New York Central and Utica and Black river railways, and the Erie and Chenango canals, 95 m. w.n.w. of Albany. The city, regularly and handsomely built, rises from the s. bank of the river to an elevation of 150 ft. Among its buildings are a city hall, public halls, 34 churches, 6 large hotels, 4 banks, a cotton mill, 2 woolen mills, a state lunatic asylum with 500 patients, Catholic and Protestant orphan asylums, academies, and schools. There are also manufactories of flour, starch, organs, piano-fortes, clothing,

carriages, machinery, carpets, oilcloth, etc.; and 11 newspapers and periodicals, of which 2 are Welsh and 1 German. At the period of the revolution, Utica was a frontier trading-post, and the site of fort Schuyler, built to guard the settlements against the French and Indians. In 1813 it had a pop. of 1700; and in 1875, of 32,070.

UTICA (*ante*), the co. seat of Oneida co., on the Delaware, Lackawanna and Western railroad; pop. '80, 33,913. It is on generally level ground, and extends about 4 m. e. and west. It is regularly laid out, and contains many handsome edifices. The most common building material is brick. It has waterworks with a capacity of 400,000,000 gallons annually. It has a paid fire department. It is connected with the adjoining villages and with the driving-park by horse railroad. The city contains four parks. There is a good public library. An opera-house is owned by the Utica mechanics' association. The government has built a fine court-house and post-office. Much capital is invested in the manufacture of boots and shoes, and of ready-made clothing. Steam engines, wagons, agricultural tools, cotton and woolen goods, etc., are manufactured. Utica is the most important cheese market in the United States, the center of a great dairy region. It was incorporated as a village in 1798, and as a city in 1832.

UTICA, an ancient city of Africa, near the bay of Carthage, and a little n.w. of the site now occupied by Tunis. Tradition gives the date of its founding by the Tyrians as 287 years before that of Carthage, of which it was an ally against Rome; but in the third Punic war, Utica, by early submission to Rome, obtained the grant of part of Carthage's territory. By Augustus it was made a free city, and was recovered by the Byzantine emperors from the Vandals, but was destroyed by Arabs near the end of the 7th century.

UTILITARIANISM, the name of the peculiar theory of ethics, or of the ground of moral obligation, that adopts, as the criterion of right, the happiness of mankind. The word "utility" was employed, in this acceptation, by Jeremy Bentham; the form "utilitarianism" was first used by John Stuart Mill.

The doctrine of utility is opposed to all those theories that refer us to some internal sense, feeling, or sentiment, for the test of right and wrong; a test usually described by such phrases as a moral sense, and innate moral distinctions. See ETHICS. Whence utility is sometimes termed the *external* or objective standard of morality. It is also opposed to the view that founds moral distinctions on the mere arbitrary will of God.

The utilitarian theory has been maintained both in ancient and in modern times, although with considerable variation, not merely in the mode of stating it, but in important peculiarities. Thus, in ancient times, it was held by Epicurus, but in a purely self-regarding form; each person's end was his own happiness exclusively, the happiness of others being instrumental and subordinate. The modern phase of the theory may be said to begin with Hume. He employed, as the leading term of his system, not utility, but benevolence; whereby he gave especial prominence to the disinterested side of moral actions. He strenuously maintained, what must be regarded as the essential feature of the utilitarian doctrine, that no conduct is to be deemed worthy of moral approbation unless, in some way or other, it promotes human happiness; and that actions ought to be visited with disapprobation, exactly according as they have the opposite tendency.

Jeremy Bentham is, more than any other person, identified with the theory of utility, which was, in his hands, not merely the foundation of ethics, but also the basis and justification of political and legal reforms. Having in view the state necessity of sacrificing smaller interests to greater, or, at all events, of not sacrificing greater interests to smaller, he described the ethical end as "the greatest happiness of the greatest number." He illustrated the doctrine by setting it in opposition to *asceticism*, which he interpreted to mean, that pleasure is forfeited, and pain incurred, without yielding a compensating amount of good, either to the agent or to other persons.

Paley advocated a form of utility. He made the will of the Deity, enforced by future rewards and punishments, the impelling motive to duty; but in determining what that will was, in particular cases, he included a reference to the beneficial tendency of actions.

James Mill maintained substantially the views of Bentham. Sir James Mackintosh, while differing in some points from Bentham and from Mill, in the main adhered to utility as the ultimate standard of right. John Austin, in his *Province of Jurisprudence Determined*, has contributed a lucid exposition and a powerful defense of the principle. John Stuart Mill has devoted a separate work to the subject. Samuel Bailey, in his *Letters on the Human Mind*, vol. iii., has discussed the ethical problem fully, and pronounced upon the utilitarian side. Herbert Spencer ranks among the upholders of the theory; and likewise Bain, in his edition of Paley (Chambers's series), and in *The Emotions and the Will*.

Before stating the arguments for and against the principle of utility as the basis of morals, it is proper to inquire what sort of proof an ethical system is susceptible of. Ethics is a practical science (see SCIENCES), and, as such, involves an end; having the peculiarity of being the final or comprehensive end of all human conduct. See TELEOLOGY. Now, in the speculative or theoretical sciences, *ultimate* principles cannot be proved; it is the nature of proof to rest one doctrine on some other doctrine, so that we

must come at last to what is taken without proof; we cannot prove our present sensations; nor can we demonstrate that what has been will be; we must take these things for granted. And so it is with ultimate ends in the practical sciences: we cannot prove that each person should seek his own happiness; we must assume it as an ultimate fact, and trace the consequences. The final end of all conduct cannot be reasoned; it must be gathered from the actual conduct of men; we must find by observation what ends men actually pursue, and, if we can, generalize them into one comprehensive statement. The function of argument in the case is to show where inconsistency has crept in, or to make professions accord with practice. Thus it is that the supporters of utility aver that men, even although refusing the theory, still proceed upon it in their conduct; and that the doctrine cannot be impugned consistently with the admitted motives of human action. Human beings, as a rule, have no other end in life but happiness, either for themselves or for others; and morality belies human nature if it does not accord with this universal object of pursuit.

Although utilitarians hold that good and evil, right and wrong, are properly determined by a calculation of the consequences as regards human happiness, they do not all maintain that past or existing systems of morals have been on all points framed on this principle. Bentham and James Mill appear to have thought that the rule has always been kept in view, though often badly applied. But others, equally earnest in regarding it as the only legitimate rule, are of opinion that, in the past and existing ethical precepts, men have been guided partly by utility, and partly by sentiment—that is, liking or disliking for the act itself, irrespective of any further consequences. Thus, the veneration of the Hindu for the cow, on which ethical duties are founded, is an instance of sentimental liking; the Jewish or Mohammedan prohibition of the pig is a matter of sentimental dislike. In the ceremonial rights of ablution, so widely prevalent, there is a certain show of utility, mixed up with the fancy of cleanliness or purity. In the doctrine of the sacredness of kings, there is a combination of utility and sentiment.

The following are the chief objections to the utilitarian scheme, with the arguments in reply:

I. It is maintained that happiness is not, either in fact or in right, the sole aim of human pursuit; that men actually, deliberately, and by conscientious preference, seek other ends. For example, virtue is an end in itself, to be sought whether it yield happiness or not, and even if it should be productive of the greatest misery. The qualification, however, is always added, that virtue, in the long run, without intending it, and all the more for not intending it, is the unfailing source of happiness.

To which the supporter of utility answers:

1. It is quite true that men seek other ends than immediate happiness to themselves and to others, and that, in particular, they cultivate the virtues as ends in themselves, without always thinking of them as means to happiness. But, then, this is by the operation of a familiar law of the mind, whereby what was originally of the nature of means comes at length to be valued as an end; such is the well-known case of the love of money. The virtues of justice and veracity are essential to human society, just as money represents the basis of subsistence; and by frequent association, the regard that we pay to the end is transferred at last to the means.

2. It may be shown in many ways that the great social virtues derive their worth, in our estimation, from their subservience to human happiness, and not by any absolute title of their own. Take, first, veracity or truth, which, of all the moral duties, has most the appearance of being an absolute and independent requirement. A little consideration will show that even this is not, in our eyes, an unlimited or unqualified virtue. Men have always approved of deception practiced toward an enemy in war, to a madman, or a highway robber; also secrecy or concealment, even although misinterpreted by others, is generally allowed—unless it leads to some pernicious results; while, if the divulgence of truth were attended with harm, it would be universally reprobated. But an absolute standard of truth is incompatible even with secrecy or disguise; in departing from the course of perfect openness, or absolute publicity of thought and action, in every possible circumstance, we renounce ideal truth in favor of a compromised, qualified veracity—a following of truth only so far as is expedient.

Again, as regards justice, the presence of considerations of utility is equally obvious. There is no absolute rule of justice that does not bend to circumstances. If justice be defined, giving every one his own or what he is entitled to, there is the show of an absolute rule; but, in reality, nothing is determined. The meaning is to give to each what *law and custom* have declared to be a man's own. It is declared just for an elder son to receive a larger share of the parental estate than all the rest of the children put together; but it is clear that whatever justice there is in this must be founded on some ground of expediency. (See on this subject, J. S. Mill's *Utilitarianism*, chap. v.)

II. It is further objected to the adoption of utility as the standard of right, that the full consequences of actions are too numerous, involved, and complicated to be reduced to calculation; and that even where the calculation is possible, people have seldom time to make it.

To this it is answered, first, that the primary moral duties refer to conduct that can be fully calculated to the satisfaction of any reasoning mind. Thus, to revert to the

two leading examples, truth and justice: the habitual disregard of these duties would soon bring a society to utter confusion and ruin; without them there could be no social co-operation: man would fall below the condition of the gregarious animals; the race could hardly be saved from extirpation. On the other hand, the observance of these duties, in a high degree, raises to a corresponding degree the means of human happiness. The balance of advantages is all on one side—there is no case for the other side at all.

There have always been moral rules or enactments where the calculation of consequences was much less easy; for example, the indissolubility of marriage is maintained in some countries and not in others; and there have been considerable differences as to the forbidden degrees of affinity in marriage. In these usages there are both advantages and disadvantages, and the preponderance is variously estimated by different calculators. In such cases the utilitarian would say: Do not make a compulsory enactment restricting liberty, which restriction is an evil in itself, unless the balance of advantages is unquestionable and great.

As to the argument that it is impossible to make the calculation of consequences every time we perform a moral act, the reply is, this is unnecessary; the calculations as to the various duties have been already made, and are embodied in rules, which rules we remember and apply without thinking of the process gone through in arriving at them. The navigator at sea does not need to compute the *Nautical Almanac* every time he determines his longitude; he carries it to sea with him ready for use.

III. A third objection is that men in all ages have distinguished between the right and the expedient, that is, the useful; the two are in most languages put in opposition or contrast. The reply is that the expedient, when thus opposed to the right, commonly means what is expedient for the agent at the time, but is not expedient for people generally, or even for himself in the long run. It is sometimes expedient, in this sense, to tell a lie, to rob, or to murder; but such actions are not expedient in the sense of general utility, or the greatest happiness of mankind.

It is further to be remarked in this contrast of the expedient and the right, that the expedient may mean simply an addition to our conveniences or comforts, something that it is well for us to have, but that we might do without. Thus it is highly expedient to possess cheap postage, railways, and electric telegraphs. On the other hand, the right points to the essentials of our existence; without the fulfilment of contracts, respect to life and property, obedience to law, society would be dissolved. The distinction was expressed in one of Cromwell's speeches, by the contrast of a nation's being and its well-being; what secures the one is emphatically the right, the promotion of the other is the expedient. Right is the highest and most imperative form of expediency.

IV. A fourth objection against the utilitarian scheme is that all useful things are not made obligatory; it may be useful to have railways, but it is not a duty of every man to make them. But the utilitarian, while contending that nothing should be made a moral duty but what contributes to the happiness of mankind, does not hold the converse, that whatever promotes human welfare is a moral duty.

So much for the objections. The positive ground of utilitarianism is that men actually recognize happiness as their paramount consideration, or highest end. This, as a general rule, is too obvious to require proof. Each one's plan of life is principally made up of ideas of happiness to self or to others. All our good wishes to one another are repetitions of the one idea, "May you be happy." The seeming exceptions have been noticed above.

One of the strongest confirmations of the doctrine is derived from the usual inducements to right conduct, common to all moralists. We find that no one can preach morality without making use of its bearings upon happiness. The very meaning of the terms expressive of the highest virtues—love, goodness, mercy, compassion, fidelity, honesty, integrity, justice—is something that relieves the pains and augments the pleasures of sentient beings. To love is to make the object happier, and love is the fulfilling of the law.

Although there be duties occasionally imposed upon men that have no obvious tendency to increase happiness, but rather to diminish it, as the labors of some cumbrous ceremonial system like Hinduism, those duties have to be upheld by the fear of punishment or the hope of reward, still testifying to the predominating motives of the human mind. It is not, however, by reference to traditional observances that the happiness motive is most clearly tested. The proper plan, as remarked by Mr. Samuel Bailey, is to try it upon some fresh case, some entirely new enactment, when it will be found that the interest or happiness of the community is the *sole* consideration appealed to. If a new law of inheritance is proposed, or a new government board constituted, nobody advances any other criterion but expediency, or the good of certain persons now or in the future; unless such expediency can be shown, no one will move in the matter at all; and the earnestness of the promoters will be in exact proportion to their sense of the resulting good. We may, through blind conservatism, keep up usages not only destitute of utility, but productive of harm; but we should not now deliberately set up for the first time any practice that we did not regard as conducive to somebody's well-being. Traditional associations excepted, the strength of our approbation or disapprobation always follows our estimate of happiness or misery produced.

It is worthy of remark that utility, or the promotion of human welfare, as it is the very meaning of the work of a public benefactor, expresses the sum of the labors of all the best men that have ever lived.

UTOPIA (Gr. *ou*, not; and *topos*, a place, equivalent, therefore, to "Nowhere") is the name given by sir Thomas More (q.v.) to the imaginary island which he makes the scene of his famous political romance, *De Optimo Reipublice Statu, deque Nova Insula Utopia*, originally published in Latin, at Louvain, in 1516, and translated into English by bishop Burnet. This island, which More represents as having been discovered by a companion of Amerigo Vespucci, is the abode of a happy society, which, in virtue of its wise organization and legislation, is free from the harassing cares, inordinate desires, and customary miseries of mankind. More's romance obtained a wide popularity, and the epithet *utopian* has since been applied to all schemes for the improvement of society which are deemed not practicable—e.g., to those of St. Simon (q.v.) and Fourier (q.v.). Everything, however, is not utopian that is called such. All the great changes that have taken place in the world have had to pass through a "utopian" phase.

UTRAQUISTS (Lat. *utraquistæ*, from *utrâque*—i.e., *specie*, in both kinds), a name at first given to all those members of the western church, in the 14th c., principally followers of John Huss, who contended for the administration of the eucharist to the laity under both kinds; but in later times restricted to one particular section of the Hussites, although all the members of that sect alike claimed this as a fundamental principle of their church discipline. The name may be said to date from 1415, when the followers of John Huss, in Prague, and elsewhere in Bohemia, adopted "The communion of the cup" as their rallying cry, and emblazoned the cup upon their standards, as the distinguishing badge of the association. In 1417 the university of Prague, by a formal decision, directed that all the laity should communicate in both kinds; and the council of Constance, in consequence, prohibited students from any longer resorting to Prague for the purposes of study. The Hussite party, on the contrary, made the demand one (the second) of the four points upon which they insisted as the condition of their submission to the church. Their demands were rejected by the council of Constance; but the council of Basel, in 1433, acceded to the demand for the cup, under the condition that, whenever communion was so administered, the ministering priest should accompany the ministration with a declaration that Christ was contained whole and entire under each species. A portion of the Hussite party was content with the explanation of this and the other points offered by the council, but the more violent held out. See **HUSS**. The former were called Utraquists, and continued to be so designated. During the reformation troubles, this division was still maintained. The Utraquists were favorably regarded by the imperial party; and after the battle of Mühlberg, in 1547, they alone were formally tolerated in Bohemia and Moravia. One of the most celebrated leaders was Jacobus v. Mies. The name Utraquist is still applied to certain districts or villages in Bohemia and Moravia; but it is used not in reference to this theological controversy, but merely to convey that, in these villages or districts, *both languages*, Bohemian and German, are spoken.

UTRECHT, a province of the Netherlands, bounded on the w. by South Holland, n. by North Holland and the Zuyder Zee, e. by Gelderland, and s. by the Rhine and Leek. It is 42 m. from e. to w., and 21 from n. to south. Superficial extent, 346,405 acres; 62,500 of which are arable, 180,000 pasture, 39,000 in wood, the remainder waste land and water. The chief places are Utrecht, Amersfort, Rhenen, Wijk bij Duurstede, Montfort, and Ijsselstein (pronounced Isselstein). There are 66 country parishes, the number having been reduced from 86 by union. Pop. '74, 181,957; rather more than 36 per cent are Roman Catholics; the remainder, except 1611 Jews, are Protestants.

The country is varied by beautiful hilly districts, level fields, orchards, tilled land, meadows, and moss. The hilly tract stretches from near Amersfort to Rhenen on the Rhine, 21 miles. It is well wooded. Rye, oats, and buckwheat are sown; sheep, cattle, and bees extensively kept. To the s. of this belt is rich clay land, producing excellent wheat and barley. Near Amersfort and Rhenen, tobacco is largely planted, the crop of 1865 being 948,750 lbs. The stock amounted to 12,771 horses, 76,989 horned cattle, 32,997 sheep, 20,547 swine, 4,678 goats, and 13,835 bee-hives.

Utrecht is watered by the Rhine, Vecht, Leek, Amstel, Grebbe, and many other rivers. The inland fishing is trifling; but many herrings, eels, flounders, anchovies, etc., are taken in the Zuyder Zee. Besides agriculture, the industries are soap-boiling, sawing wood, copper and iron founding, making machinery, carpets, tiles, bricks, coarse pottery, cement, etc. There are many beautiful country-seats, the climate being dry and healthy.

UTRECHT (*Utrajectum*, or *Trajectum ad Rhenum*), the provincial capital, is beautifully situated in the midst of a district composed of sand-hills, woody heaths, rich grassy meadows, extensive orchards, flower-gardens, and cultivated fields. It lies 24 m. s.e. from Amsterdam. When the census was taken (1869), the pop. numbered 59,299; at the end of 1877 it was 67,341. The broad walls have been leveled, planted with trees, and formed into beautiful and well-kept promenades.

Utrecht is favorably situated for trade, being the point from which several railways radiate, and having excellent water-communication by the old Rhine and the Vecht. The

staples are grain, cattle, and various manufactures. It is the residence of many noble families, the seat of a university, national veterinary school, national hospital, high military court, the mint, etc. Principal buildings are the cathedral or Domkerk, the town-house, the mint, the university, and several handsome barracks for the infantry and cavalry, especially the Willemskazerne. The cathedral was consecrated to St. Martin about 720. In 1674, a hurricane destroyed the body of the building between the choir and the tower, so that the latter (321 ft. high) is now isolated. The famous university of Utrecht, founded in 1623, numbers about 500 students, and has a good library. Utrecht has been for centuries the head-quarters of the Jansenist church (q.v.). There is a national school, for military surgeons; a grammar-school; normal school for teachers; a musical college, for elementary singing, the piano, and violin; a historical society; meteorological institute; medical society; pharmaceutical society, etc. Education generally stands high.

The charitable institutions are numerous. Principal industries are—manufacturing tobacco and cigars, woolen fabrics and carpets, making salt, furniture, baskets, tin, copper, and silver work, sawing wood, rope-making, iron-founding, book-printing, etc. The royal cigar factory alone makes 40,000 daily.

Utrecht is one of the oldest cities of the Netherlands, and probably was founded by the Romans. Here the famed union of the northern provinces for the defence of political and religious freedom was formed Jan. 23, 1579. For a short time in 1807, Louis Napoleon, king of Holland, resided in Utrecht. It has been the birthplace of many distinguished men, among others pope Adrian VI. in 1459.

Utrecht has acquired a degree of celebrity for the treaties there concluded, which brought to a close the war of the Spanish succession. See SUCCESSION WARS. After this disastrous conflict had endured for more than 10 years, Great Britain, finding that the reasons which had prompted her to engage in it no longer existed, tried to induce Austria to come to terms with France, but failing in this, at once signed private preliminary articles for herself, Oct. 8, 1711. On Jan. 12, 1712, a congress was opened at Utrecht; and France, desirous, at almost any price, of detaching Britain from the grand alliance, voluntarily made so many concessions, that the latter had only further to demand the banishment of the elder pretender, whose sojourn in France had been a source of disquietude, the conclusion of a treaty of commerce, and indemnities for her allies—all which points were at once conceded. But the preposterous demands of Austria, which included not only the renunciation by the Bourbons of the entire Spanish empire, but the restoration of all those places which had been ceded to France by the treaties of Münster, Nimeguen, and Ryswick, and the retention of all Austria's conquests in Italy, the Low Countries, and Spain, forced the French to break off the conferences, in the hope of making a separate peace with Britain, and compelling the other allies, by negotiation or arms, to lower their pretensions. This plan was successful; agreement on all points at issue was established between France and Britain in Aug., 1712; and arrangements were also come to with Holland, Portugal, Prussia, and Savoy soon afterward. As each of the contracting parties negotiated in its own name, no fewer than nine distinct treaties of peace were signed in the following spring, April 11, 1713. By the treaty between France and Britain, the former ceded St. Kitt's, Hudson bay, Nova Scotia, and Newfoundland (the liberty of fishing for cod being reserved), recognized formally the reigning dynasty and the Hanoverian succession, agreed to demolish the fortifications of Dunkirk, engaged that the crowns of France and Spain should never be united, and that no part of the Spanish Netherlands should ever be ceded or transferred to France; and Spain renounced her Italian possessions in favor of Austria, and gave up Gibraltar and Minorca to Britain, with which power she also concluded the *assiento* (q.v.) treaty. The chief of the special agreements with the other contracting parties were as follows: Ypres, Knocke, etc., to be exchanged with Holland for Douai, Bouchain, etc., and a treaty of commerce to be concluded; both banks of the Amazon to belong to Portugal; Spanish gelders and the district of Kessel, to be ceded to Prussia, and its ruler's title of king, assumed in 1701, formally recognized, Prussia in turn resigning all claims to the principality of Orange; the duke of Savoy to obtain Sicily, with the title of king, etc. The treaty of Utrecht did not made peace with Austria and the German empire; but in the following year, at Rastadt and Baden, they agreed to substantially the same terms as were proffered at Utrecht. The electors of Cologne and Bavaria, who had been put under the ban of the empire, were restored; Sardinia, granted to Bavaria at Utrecht, was restored to Austria; Austria renounced her claims to the Spanish succession; the cession of the Spanish possessions in Italy was confirmed; Breisach and Freiburg, in the Breisgau, were also given to Austria; the highest ridge of the Maritime Alps was made the boundary between France and Savoy; and on failure of the Spanish Bourbons, the crown of Spain was to fall to the house of Savoy.—See lord Mahon's *History of the War of Succession in Spain* (Lond. 1832).

UTRE'RA, an old t. of Spain, in the province of Sevilla, and 18 m. by railway s.e. of the city of that name. In early times, it was flourishing and populous; but fell into a state of stagnancy, from which it has begun to revive along with the rest of Spain. It is important as a military post, contains a beautiful Gothic church, a Moorish castle, and cavalry barracks. The streets and promenades are kept clean and fresh by streams of

running water. Utrecht contains upward of 13,000 inhabitants, mostly agriculturists engaged in the productive estates which surround the town. Corn, wine, oil, and fruit are produced. Sheep and cattle, as well as a breed of fierce bulls, are reared in the vicinity.

UTRICLE is the botanical term for a kind of seed like the achenium (q.v.). In the utricle, however, the pericarp does not lie close to the seed, but surrounds it as a loose inflated covering.

UTRICULARIA. See **BLADDERWORT**, *ante*.

UTTERING COUNTERFEIT COIN is an offense punishable with one year's imprisonment with hard labor. The punishment is increased if, besides uttering, the person has other counterfeit coin in his possession. It is also an offense to utter false foreign coin as the queen's coin or as foreign coin.

UTTOXETER, a market-t. of Staffordshire, on an eminence above the vale of the Dove, 16 m. n.e. of Stafford. A church with an ancient tower and lofty spire is the only noteworthy building. There are two large breweries in the town, with a rapidly increasing business. Pop. '71, 3,604.

UVALDE, a co. in s.w. Texas, consisting of level, fertile plains; 1070 sq.m.; pop. '80, 2,541—1995 of American birth, 63 colored. Co. seat, Uvalde.

UVULA. See **PALATE**.

UWINS, THOMAS, 1782—1857; b. England; educated for the profession of an engraver, but became a painter in water-colors and oils. His pictures were mostly of Italian scenes, and among the most popular were: "Dressing for the Festa, The Fisherman's Song of Naples, and Interior of a Saint Manufactory at Naples."

UXBRIDGE, a market-t. in the co. of Middlesex, on the Colne, 15 m. w. of the city of London. Pop. '71, 7,407. Its corn market is one of the most important in the kingdom.

UZBECKS. See **USBEGS**.

V

V, THE twenty-second letter in the English alphabet, is derived directly from the Lat. character *v*, which represented originally both the consonant *v* and the vowel *u* (see **U**). The name of the letter is derived from the Phenician and Hebrew *vau* (signifying a nail, which the form of the letter originally resembled), which stood sixth in the alphabet, and became the digamma (q.v.) of the old Greek, and the *f* of the Latin (see **F**). The Greek *v* (see **ALPHABET**), from which the Lat. *v* is taken, had, in the classical period, degenerated into a sound like the French *u*, and in modern Greek is undistinguishable from *i*. The Greeks, after they had lost the digamma, represented Lat. *v* by *ov* or *β*; e.g., *Ουαρρων* or *Βαρρων* = Varro, *Βιργιλιος* = Virgilius. In the beginning of Latin words, *v* must have had a consonantal sound approaching that of *v* in English, as is inferred from its persistence as compared with the Greek digamma: e.g., Vinum = (F)οἶνος, Vesta = Ἑστία. Between two vowels, on the contrary, it was often dropped out, as in *nuper* for *novumper*, *Jupiter* for *Joεῖpiter*, *prudens* for *providens*; from which we may conclude that it had in that position the power of a semivowel, like Eng. *w*. In new high German, *v* takes the place of Gothic and Eng. *f* (see **F**), and is pronounced like *f*, while the *v*-sound is expressed by *u*.

VAAL RIVER, the Dutch name of one of the most important branches of the Gariep or Orange river, and signifying yellow, from the color of its waters when in flood, its Hottentot name, Ky Gariep, having really the same signification; the Betjans call it Namagari. It rises in the Mount of Sources, at the n.w. angle of Natal, and running a very circuitous course of about 500 m., forming the boundary between the Orange River Free State and the Transvaal Republic and Betjuana tribes, it joins the other great branch, the Nu Gariep or Orange river, in lat. 29° 10' s., long. 24° 28' east.

VACATION, in legal language, means the holiday usually enjoyed by lawyers in consequence of many of the courts being closed, and thereby some steps in a suit not being competent during part of the autumn of each year. There are short vacations during other parts of the year; but the long vacation is that which extends from Aug. 10 to Oct. 24, and during that part of the year it is usual for legal business to be in great measure suspended.

VACCINATION is the process by which a specific disease, termed *vaccinia*, or cow-pox (from the Latin word *vacca*, a cow), is introduced into the human organism with the view of protecting it against an attack of an incomparably more severe disorder—viz., small-pox. For the history of this remarkable discovery of vaccination—"that masterpiece of medical induction"—we must refer to the life of Jenner (q.v.). In his *Inquiry into the Causes and Effects of the Variola Vaccina*, published 1798, he established the following facts: (1) That this disease casually communicated to man has the power of rendering him unsusceptible of small-pox; (2) that the specific cow-pox alone, and not other eruptions affecting the cow, which might be confounded with it, had this protective power; (3) that the cow-pox might be communicated at will from the cow to

man by the hand of the surgeon, whenever the requisite opportunity existed; and (4) that the cow-pox once ingrafted on the human subject, might be continued from individual to individual by successive transmissions, conferring on each the same immunity from small-pox as was enjoyed by the one first infected direct from the cow.

The *method of vaccinating* and the *phenomena of cow-pox*, as observed in the human subject after vaccination, claim our first and chief attention. Except under circumstances of special risk (as, for instance, where small-pox is in the neighborhood), children should only be vaccinated when they are in apparently good health. Diarrhea and skin diseases are especially to be avoided; and it is important to see that there is no chafing behind the ears, or in the folds of the neck or groin. As more than one-fourth of the whole number of deaths from small-pox in England during the six consecutive years 1856-61, took place in children of less than one year, it is obviously expedient that children should be vaccinated in very early infancy, provided health permits. Dr. Seaton, in his comprehensive article on this subject in Reynold's *System of Medicine* (1866, vol. i. p. 489), observes that "plump and healthy children living in large towns should be vaccinated when a month or six weeks old; in more delicate children, the vaccination might be postponed till they are two or three months old; but all, except those whose state of health positively contra-indicates vaccination, should be vaccinated by the age of three months." This early age has also the advantage of being free from the irritation of teething.

The lymph to be used should always be taken from a healthy child, and from thoroughly characteristic vesicles; and when lymph in all respects satisfactory cannot be procured as is often the case in country districts, the operation should be postponed. Lymph is usually taken when the vesicle is fully formed, which is usually about a week after vaccination; if it is not taken till the areola (which will be presently described) is complete, its protective power is far less certain. "Prime lymph," says Dr. Seaton, "has always a certain degree of viscosity; and a thin serous lymph, even from a vesicle which is not advanced, is to be avoided. Babies are much better lymph-givers than elder children or adults; and children of dark complexion, not too florid, with a thick, smooth, clear, skin, yield the finest and most effective lymph." Lymph should always, if practicable, be passed direct from arm to arm; and preserved lymph should only be had recourse to when a vaccinated child cannot be obtained. A good vesicle freely punctured on its surface exudes enough lymph or vaccine matter for the direct vaccination of five or six children, and for charging six or eight ivory points for future emergencies. The process of vaccination consists essentially in introducing the lymph into the structure of the true skin, or in bringing it in contact with the absorbing surface. This may be effected in various ways, one of the most common being by puncture. As the operation is extremely simple, and the knowledge of the mode of performing it may prove useful to many of our colonial readers, we shall briefly describe it. The skin on the outside of the arm, below the shoulder, should be held upon the stretch, and a very sharp, clean lancet, well charged with lymph, should be made to puncture the skin from above downward, at an angle of about 45°, and be made just to enter the true skin. The matter thus inserted is retained by the valvular character of the puncture and the elasticity of the skin. In this form of the operation, not less than five or six such punctures should be made, at a distance of half an inch from the other; and for the sake of security, three punctures may be made on each arm. If the lymph is preserved on points, each point, after being held in the steam of hot water so as to dissolve the lymph, should be inserted into the punctures made by an ordinary lancet. Some surgeons make a number of minute superficial punctures over a patch of the size of a fourpenny-piece, and spread the lymph over this spot with the flat part of the lancet: this kind of tattooing should be repeated on three spots. Others make a number of parallel scratches, or crossed scratches, with a charged lancet; and others, again, use special scarifiers or rakes, consisting of three or four needle-points inserted in an ivory handle; and drawn either once or again at right angles over the tense skin, the lymph being then plastered over the scarified surface. Of these various plans, Dr. Seaton believes that the best marks and most successful treatment result from this last plan of cross scratches. A far better plan of preserving lymph than that of drying it on points, is that of preserving it in a fluid state in Husband's closed capillary tubes, in which form it is ready for use without any preparation. When the operation is successfully performed, the skin at the spot becomes slightly elevated, hard, and red on the third or fourth day; on the fifth or sixth day a vesicle of a blueish-white color forms, which presents an elevated edge and a depressed cup. It is distended with clear lymph, and attains its perfection on the eighth day; and now, or on the ninth day, the vesicle is surrounded by an inflamed ring or areola; on the ninth, tenth, and eleventh days the vesicle becomes a pustule, the cupped form disappears, the areola enlarges till it becomes a circle, with a diameter of from one to three inches. On the twelfth, thirteenth, and fourteenth days the pustule dries up; and in the course of the next week the scab separates and falls off; it seldom remains so long as the twenty-fifth day. It leaves a cicatrix, which commonly is permanent in after life, circular, somewhat depressed, dotted or indented with minute pits, and in some instances radiated. The establishment of the areola is accompanied with constitutional disturbances, as indicated by restlessness and heat of skin, frequent derangement of the stomach and bowels, and occasional swelling of the glands of the

arm-pit. These symptoms are seldom severe, but seldom quite absent. We occasionally meet with cases in which the course of the above symptoms is modified, as when they are simply retarded, or simply accelerated, or altogether irregular and spurious; and it should be carefully borne in mind that "a vaccination presenting any deviation from the perfect character of the vesicle and the regular development of the areola, is not to be relied on as protective against small-pox."—Seaton, *op. cit.* As a general rule, neither the local nor the constitutional symptoms of ordinary vaccination require any treatment.

From investigations conducted some years ago by order of the government, and published in several of the *Reports of the Medical Officer of the Privy Council*, it appears that amongst the poorer classes, vaccination is often so imperfectly performed as to leave no mark, and to exert no protective power. Mr. Marson of the Small-pox hospital believes that with good lymph, and the observance of all proper precautions, a good vaccinator should not fail of success in his attempts to vaccinate above one in 150 cases; while Dr. Seaton puts one failure as a fair proportion in 170 cases.

The official inquiries above referred to, in the course of which the arms of nearly half a million vaccinated children were examined, prove, says Dr. Seaton, who was employed in the investigation, the great extent to which imperfect or insufficient vaccination has obtained: taking the country throughout, not more than one child in eight was found to be so vaccinated as to have the highest degree of protection that vaccination is capable of affording; and not more than one in three could, on the most indulgent estimate, be considered as well protected. The main causes of this imperfect success were the following: "(1) The frequency with which practitioners, instead of attempting fully to infect the system, had been satisfied with insertions of lymph sufficient to produce only one, two, or three ordinary vesicles; (2) the want of due attention to the selection of the lymph used in vaccinating; (3) carelessness and clumsiness in the performance of the vaccination, so that, if the operation did not wholly fail, it very frequently resulted in a less degree of effect than it had been the aim of the operator to produce; and (4) the great and unnecessary extent to which the use of preserved and conveyed lymph was substituted for vaccination direct from the arm."—Seaton, *op. cit.*, p. 503. The following observations made by Drs. Buchanan and Seaton during the epidemic of small-pox in London in 1803, on upwards of 50,000 children in various national and parochial schools, workhouses, etc., are of such extreme importance that we make no apology for inserting them. Some of the children had never been vaccinated; the large majority had been vaccinated in various manners and degrees. Of every 1000 children without any mark of vaccination, no fewer than 360 had scars of small-pox; while of every 1000 children who had evidence of vaccination, only 1.78, on an average, had any such traces: and with regard to the quality and amount of the vaccination, it was found that, of children having four or more cicatrices, only 0.62 per 1000 had any trace of small-pox; while of those who had a single bad mark, 19 per 1000 were scarred by small-pox. Hence the best vaccination was more than 30 times as protective as the worst, and the worst was more than 47 times better than none at all. The importance of the completeness of the vaccination, as shown by the cicatrices, is also well shown by the results obtained by Mr. Marson. From the study of more than 15,000 cases at the small-pox hospital, he finds that while the unvaccinated died at the rate of 37 per cent, the vaccinated have died at the rate of only $6\frac{1}{2}$ per cent; the mortality among those with four or more scars being only 0.55, while that among those with only a single scar was 7.73 per cent; so that, while the average risk which vaccinated persons run if they do catch small-pox is about $\frac{1}{4}$ of the risk run by unvaccinated persons, well-vaccinated persons run less than $\frac{1}{10}$ part of the risk. It must further be borne in mind that, while few unvaccinated persons do not at some period of life sustain an attack of small-pox, the cases are comparatively rare in which a well-vaccinated person catches the disorder; so that the protective power of vaccination shows itself in two ways, viz.: (1) in shielding the constitution, in the great majority of cases, from any kind of an attack of small-pox; and (2) in the exceptional cases, of so modifying the disease as almost invariably to deprive it of danger to life, or of those terrible disfigurements which the unmodified disease so frequently leaves behind it.

With regard to the subject of *re-vaccination*, it has been amply demonstrated that its utility and necessity stand upon no speculative reasoning, but upon the broad basis of experience and observation. This operation should be performed with the same care and pains as primary vaccination, nor should it be left to periods when small-pox is epidemic, but should be performed on all persons after puberty, and this is the more necessary for the primary operation is often very imperfectly performed. During an epidemic of small-pox, even young children, if the marks of the primary vaccination are at all imperfect, should most decidedly be re-vaccinated. In re-vaccinating it must always be remembered that "the local results of re-vaccination of any individual give us absolutely no information whatever as to the constitutional condition in which the re-vaccinated person was with regard to the liability to contract small-pox."

Much has been written regarding the *dangers of vaccination*; and the well-known Rivalta case, in which an infant thus communicated syphilis to a whole population in a remote district of Piedmont (see *SYPHILIS*); and the death some years ago of a distinguished middle-aged baronet from (as it was alleged) vaccination with impure lymph, have directed special attention to the subject. For the discussion of this subject we

must refer to Mr. Simon's *Papers relative to the History and Practice of Vaccination*; and we will only remark that those who have had most to do with vaccination, and those who have had the most extensive experience in the diseases of children, concur in the belief of the non-communicability of disease by this operation.

The relations between small-pox in man and cow-pox in the cow, claim a passing remark. Jenner believed that they were essentially the same disease, and that they had a common origin in the grease of the horse. Various experiments have been made to inoculate healthy cows with small-pox, and those of Mr. Ceely, of Aylesbury, in 1839, and of Mr. Badcock, of Brighton, in 1840, who induced vesicles by inoculating cows with small-pox virus, and thus obtained a supply of genuine vaccine lymph, place the identity of the diseases beyond all question. The disease really known as grease appears to have nothing to do with cow-pox or small-pox; but the horse occasionally suffers an affection which is precisely the same as the small-pox in man and the cow-pox in cows; and the lymph from this horse-pox has been successfully used for vaccination.

In conclusion, a brief paragraph must be devoted to the legal bearings of the question. In 1841 the vaccination act was passed, which made the practice of inoculating with small-pox virus unlawful. In 1853, another act, known as Lord Lyttelton's vaccination act, was passed, with the view of rendering the practice of vaccination compulsory, but this, though useful as far as it goes, proved a very imperfect measure. The public health act, passed in 1858, gives to the privy-council the power of appointing *public vaccinators* to give instruction in all practical points bearing on vaccination, for granting certificates of proficiency, and for the vaccination of poor persons residing in unions and parishes. They have, moreover, made arrangements for supplying lymph, guaranteed by the national vaccine board, to all medical practitioners who apply to "the registrar of the national vaccine establishment, privy-council office, London, s.w." The vaccination act of 1867 was passed to "consolidate and amend the statutes relating to vaccination in England." By it the parent must have the child vaccinated within three calendar months from the child's birth, and the vaccination must be repeated until successful. The vaccination act of 1871 adds one or two new provisions.

VACCINIA CÆÆ, a natural order of exogenous plants, differing from *Ericææ* chiefly in having an inferior ovary and succulent fruit. Many botanists make it a section of *Ericææ*. About 200 species are known, natives of temperate climates, in all parts of the world, but chiefly in the northern hemisphere. A few species, remarkable as being parasitic, are natives of Peru. The vacciniacæ are shrubs, and rarely small trees, with numerous round or angular branches, simple leaves on very short stalks, and flowers solitary or in racemes. Whortleberries (q.v.) and cranberries (q.v.) are the most familiar examples of the order.

VÂCH (literally, speech) is another name of *saraswati* (q.v.), the female energy of the Hindu god Brahman.

VÂCHASPATI (literally, "lord of speech," from the Sanskrit *vâch*, speech, and *pati*, lord) is, in Hindu mythology, one of the usual names of *vrîhaspati* (q.v.), the instructor of the gods.

VACHEROT, ÉTIENNE, b. France, 1809; studied at the normal school in Paris; professor there, 1833; succeeded Cousin at the Sorbonne, 1837-51, but was suspended through ultramontane influence; was dismissed, 1852, for refusing to take the oath to Napoleon III., and imprisoned 3 months for his treatise *La démocratie*, and disfranchised till 1870; elected to the national assembly, 1871. He published *Histoire critique de l'école d'Alexandrie*; *La Métaphysique et la Science*; *Essais de Philosophie critique*; *La Religion*.

VACUUM literally means empty space, or space wholly devoid of matter. From Aristotle to Descartes, metaphysical speculators took the question into their own hands, and, of course, wrote nonsense about it. Thus, Descartes commits the absurdity of saying that, if a vessel be perfectly empty, its sides must be in contact—confounding the totally distinct ideas of *matter* and *space*. The dictum that *nature abhors a vacuum*, was employed to account for the rise of water in pumps; but it was presently found that nature did not abhor a vacuum through more than an elevation of about 32 feet. See **TORRICELLI**. When the subject was taken up by its legitimate owners, the experimental philosophers, such absurdities disappeared, but real difficulties were detected. So far as experiment has yet guided us, we may assert that vacuum cannot exist. The interstellar spaces, though probably devoid of ordinary ponderable matter, or at best only occasionally visited by it, are certainly pervaded by the luminiferous medium. See **ETHER**. **UNDULATORY THEORY**, that this is matter (q.v.), is amply proved by the effects of its vibrations on the eye, and by the resistance which it has been discovered to oppose to the motion of Encke's comet. It is not merely for the propagation of light and heat that we are forced to assume that the universe is a *plenum*; Newton expressly said (see **FORCE**, where the quotation is given at greater length) "That gravity should be innate, inherent, and essential to matter, so that one body may act upon another at a distance through a *vacuum*, without the mediation of anything else, by, and through which their action and force may be conveyed from one to another, is to me so great an absurdity, that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into it." Nothing could be stronger than this; and we have in addition, the results of

modern observation, which show a connection between sun-spots, planetary configurations, and terrestrial magnetism, obviously requiring some material channel to exist between the sun and its secondaries. Faraday's electrical discoveries tend to the same conclusion.

But, in ordinary language, a vacuum is said to be produced (more or less *perfect*) when ordinary ponderable matter, such as air, is more or less completely removed from the interior of a closed vessel. Till the commencement of the present century, the most perfect vacuum that could be obtained was what is called the Torricellian vacuum—i. e., the space above the mercury in a carefully filled barometer-tube. Such a vacuum, however, is almost useless for experimental purposes, and, besides, it contains mercurial vapor.

A suggestion of Davy's, recently re-invented and greatly improved by Andrews, gives the means of procuring a much more perfect vacuum than the Torricellian. An ordinary air-pump removes all but about the $\frac{1}{125}$ of the gas in the receiver—i. e., produces a vacuum of about $\frac{1}{4}$ inch, as it is called. But if the gas employed be carbonic acid, admitted and pumped out several times, so as to get rid, as far as possible, of the last trace of air, the remaining gas will be almost wholly taken up by means of moistened caustic potash previously placed in the receiver. Concentrated sulphuric acid should also be present to desiccate the potash when it has done its work. In this way, Andrews easily obtained a vacuum of $\frac{1}{45000}$ of an inch, which remained unchanged for a fortnight. Here all but $\frac{1}{1350000}$ of the air had been removed. Further improvements, devised by Frankland, Gassiot, and others, have been made in this process, especially for the production of (so-called) vacuum-tubes for the study of electrical discharges; and the exhaustion has been sometimes carried so far that the attenuated matter remaining was unable to conduct the discharge of an induction-coil.

VAGA, PERINO DEL, or PIETRO BUONACCORSI, 1500-47; b. Florence; went to Rome; was employed by Raphael on designs in fresco for the Vatican; became greatly distinguished as a painter after the death of Raphael; was imprisoned during the sack of Rome, 1527; when released he went to Genoa; returned to Rome during the pontificate of Paul III. His style of design was that of Michel Angelo, and he excelled in classical and religious subjects: his finest work is the "Creation of Eve," at Rome.

VAGRANTS, or TRAMPS, a class of beggars, many thousands in number, who, having their headquarters in the large towns in England, wander about the country, subsisting upon charity and plunder. In England the spirit of the laws and still more of the public opinion have always been averse to putting restraints upon the inclinations of even viciously disposed persons, and, consequently, the country has never been without a class of habitual vagrants—beggars and pilferers by profession. But there is reason to believe that the number of these social pests has, for many years past, been declining, absolutely as well as relatively to population. The statute-book has long contained laws against vagrancy, but they have never been systematically executed. The severest of the early laws were directed against the gypsies—at one time a really formidable class of vagrants—and against wandering soldiers and marines, and persons pretending to be discharged soldiers and marines. Such vagrants were made liable to the punishment of felony. The vagrancy laws are now comprised in the acts 5 Geo. IV. c. 83, 1 and 2 Vict. c. 38, the vagrant act amendment act of 1873, supplemented by local police regulations. Those statutes (using the descriptive phrases of previous enactments) made idle and disorderly persons—that is, persons able, in whole or in part, to maintain themselves and their families, and neglecting to do so—liable to one month's imprisonment and hard labor; rogues and vagabonds (habitual vagrants and persons suspected of living by crime), liable to three months' imprisonment and hard labor; and a third class, described as incorrigible rogues, liable to be committed for trial at the sessions, to be kept to hard labor in the interim, and after conviction, to be sentenced to one year's imprisonment and hard labor, with whipping in the case of males. The police have authority to enter houses of reception for travelers, and to arrest persons suspected of falling under any of the above named descriptions, and carry them before a magistrate for trial. But between the difficulty of finding satisfactory evidence of the character of persons thus found wandering, the commendable fear of making mistakes, the popular feeling that vagrancy is not a crime, and the unwillingness of magistrates to add to the expense of prison establishments, the statutory powers have never been used to such an extent as to affect the prevalence of vagrancy.

On the other hand, a direct and material support has been given to vagrancy by the arrangements which, under the new poor-law, now exist in most districts for the relief of the traveling poor. In almost every union workhouse in England there is a casual ward, intended for poor artisans and laborers making their way, as they sometimes have to do, from places where work is slack to places where it is plentiful. The casual ward has been taken possession of by the vagrant, for whom the law provides only a prison-cell. From two-thirds to three-fourths of its occupants are usually habitual vagrants. Here the vagrant gets his supper, his bed, and in most cases his breakfast. The fare is exceedingly meager—a little bread with occasionally a bit of cheese, or a small quantity of skilley (gruel); and the sleeping accommodation is usually worse than that of the lowest lodging-houses—cleanliness being impossible with such occupants, and there being no desire to give them comfort. But the vagrant gets supplies of food in his

wanderings by begging and plundering; and he seeks the casual ward chiefly for the shelter and the society. In 1848 Mr. Charles Buller, then president of the poor-law board, prescribed a set of rules, which for a time almost deprived the vagrant of this resource. Relief was to be refused to all able-bodied young men unless they produced passes or certificates declaring their character from a clergyman or some person in a public position, or unless the workhouse officials were satisfied they were actually destitute; orders for the casual ward were to be given only by the police—whom the tramp regards as his natural enemies; and a suitable task of work was to be exacted from every person relieved. But these rules were soon withdrawn. In a good many cases, the police are still employed to give away the orders, and on the whole with advantage; but passes (this was the really valuable regulation) are not required; and in not a few cases, no task of work is exacted, because the poor-law guardians found that they lost money upon the work done by vagrants. In other cases, an option is given to the tramp of doing a certain amount of work, or going away in the morning without his breakfast. He almost always prefers the latter alternative. But, in general, about three hours' work is imposed; and when the workhouse authorities insist upon it, the vagrants usually—though greatly disliking work—comply with this condition.

By far the greatest number of the vagrants are men between the ages of 20 and 40, the average age being about 34. There is a small proportion of men above 40, and about an equal number of youths under 20—mostly runaway apprentices. About a fourth or a fifth are women, who are generally traveling with male vagrants; but the life seems to be too hard for women. The men often pretend to be going about in search of work, but seldom or never do work; and the majority of the vagrants are of the class who, from mental constitution, would almost die rather than work. They are, besides, it must be added, persons whom decent laborers would not allow to be associated with them. Many of them have been brought up in work-houses; others are deserters from the army, or discharged soldiers of bad character; not a few are dissipated broken-down workmen, who, while tramping about in search of work, have acquired the tramp's bad habits and love of idleness. Many of them have been brought up to crime, but want the skill and daring necessary to success in their profession. They often make some pretense of occupation, under cover of which they approach houses to beg, or steal, or bully unprotected women. They are venders of steel pens, paper, laces; tinkers, chinnenders, umbreller-repairers, ballad-singers. They are much given to small thefts; most of them are believed to be capable of any crime; but in fact they attempt few serious crimes. They are poor timid creatures, and feel that society with its police is too strong for them. They never unite together to commit crimes, but occasionally 20 or 30 of them, operating in twos and threes, work a district in concert. There is a freemasonry among them; and any new rule adopted at a work-house becomes known in two or three days over a wide district. They are usually known by slang names; their language is horribly blasphemous and obscene; and neither men nor women have the smallest regard for decency, or any conception of sexual restraints. They give a great deal of trouble at the work-houses—swearing at and threatening the officials, occasionally stabbing them, refusing to do the allotted work, and not unfrequently tearing up their clothes, in the hope that the officials, out of regard to decency, will supply them with others. The officials can only threaten them with the magistrate and the jail; but sometimes—and it is then they are most insolent and troublesome—they have a desire for rest and regular feeding, and are not unwilling to go to jail. It is hard to understand what are the enjoyments of their wandering and shiftless life. Apparently, the freedom of it and the immunity from work are its chief attractions. They have been well described as wandering about "ready for any crime, but not planning crimes, quite ready to rob, but very much afraid of large dogs, very courageous against unprotected women, but skulkers when a broad-shouldered laborer turns his eyes their way, with no purpose except wandering, no restraint except hunger, no hope except of getting drunk upon some lucky haul, nomads in the midst of civilization, simple savages without savage resources." The revival of the regulations prescribed by Mr. Buller, and the steady enforcement of the vagrancy laws—which should also be made more severe—are the measures most likely to put down vagrancy. There is no offense against society for which penal servitude would be a more appropriate penalty.

VAIR. See HERALDRY.

VAIS ESHIKA is the name of one of the two great divisions of the *Nyāya* (q.v.) school of Hindu philosophy, and probably a later development of the *Nyāya* itself, properly so called, with which it agrees in its analytical method of treating the subjects of human research, but from which it differs in the arrangement of its topics, and more especially by its doctrine of atomic individualities or *vis'eshas*—whence its name is derived.

The topics or categories (*padārthas*) under which *Kaṇ'āda*, the founder of this system, arranges his subject-matter, are the following six: (1) substance, (2) quality, (3) action, (4) generality, (5) atomic individuality, and (6) co-inherence; and later writers of his school add to these a seventh category, viz., non-existence. 1. Substance is the intimate cause of an aggregate effect; it is that in which qualities abide, and in which action takes place. It is ninefold, viz., earth, water, light, air, ether, time, space, soul, and *manas*, or the organ of affection. 2. Quality is united with substance; it comprises the

following 24: color, savor, odor, feel, number, dimension, severalty, conjunction, disjunction, priority, posteriority, gravity, fluidity, viscosity, sound, understanding, pleasure, pain, desire, aversion, volition or effort, merit, demerit, and self-restitution. 3. Action consists in motion, and abides in substance alone. It affects a single, that is, a finite substance, which is matter. Action is either motion upward or motion downward, or contraction or expansion, or motion onward. 4. Generality abides in substance, quality, and action. It is of two kinds, higher and lower—genus and species. 5. Atomic individuality resides in eternal substances, by which are meant the organ of affection, soul, time, space, ether, earth, water, light, and air; it is the ultimate difference, technically called *viśeṣa*; such differences are endless; and two atoms of the same substance, though homogeneous with one another, differ merely in so far as they exclude one another. 6. Co-inherence, or perpetual intimate connection, resides in things which cannot exist independently from one another, such as the parts and the whole, quality and the thing qualified, action and agent, species and individual, atomic individuality and eternal substance. 7. Non-existence, the last category, added to the foregoing by the modern Vaiśeṣhikas, is defined by them as being either non-existence, which is without beginning, but has an end—as that of a jar, which did not exist until its antecedent non-existence ceased when being formed out of the clay; or non-existence, which has a beginning, but no end—as that of a jar which is smashed by the blow of a mallet; or absolute non-existence, which, extending through all times, has neither beginning nor end—as when it is said that a jar is not on the ground; or mutual non-existence, which is the reciprocal negation of identity—as when it is remarked that a jar is not a piece of cloth. The nature of each of these substances, qualities, actions, etc., is then the subject of special investigation. Thus, *earth* is said to be that of which the distinguishing quality is odor; it is described as being of two kinds: eternal in its atomic character; and uneternal when in the shape of some product. Again, products are defined as either organized bodies of five sorts, or organs of perception, or inorganic masses, such as stones, etc. Among the qualities, color is defined as that quality which is apprehended only by the sense of sight; which resides in earth, water, and light; which is distinguishable in earth as white, yellow, green, red, black, tawny, and variegated; in water, as white, but not resplendent; in light, as white and resplendent, etc. *Self-restitution*—to give another instance of the definition of the qualities—is described as threefold: as impetus, the cause of activity in earth, water, light, air; and the organ of affection; as the mental process peculiar to the soul, which is the cause of memory; and as elasticity, in mats and similar substances, which causes an altered thing to reassume its former position.

Though this cursory statement must here suffice to give a general idea of the Vaiśeṣhika system, it is worthy of especial notice that, according to it, understanding is the quality of *soul*, and the instruments of right notion are treated of under the head of “understanding (*buddhi*).” Kan’āda admits of only two such instruments, or *pramāṇas*, viz., knowledge which arises from the contact of a sense with its object, and inference. Comparison, revelation, and the other instruments of right notion, mentioned in other systems, the commentators endeavor to show are included in these two. Fallacies and other modes of inconclusive reasoning are further dealt with in connection with “inference,” though with less detail than in the Nyāya, where these topics are enlarged upon with particular predilection.—The reputed founder of the Vaiśeṣhika is Kan’āda, which name the native authorities derive from *kan’a*, minute, and *āda*, eating, and sometimes, therefore, also change into *Kan’abhuḥ* or *Kan’abhakṣa* (*bhuḥ* and *bhakṣa* being synonyms of *āda*). Nothing, however, is known as to the history or date of this personage, as they are involved in the same obscurity which covers most of the renowned writers of ancient India. His work is divided into ten *adhyāyas*, or books, each of which is subdivided into two diurnal lessons; these, again, being subdivided into sections containing two or more *sūtras* (q.v.), or aphorisms, on the same topic. Nyāya-Sūtras, the work of Kan’āda has been commended upon by a triple set of commentaries, and popularized in several elementary treatises. The text with the commentary of *Śaṅkara Miśra*—who is not to be confounded with the celebrated Vedānta author—has been edited at Calcutta in 1861 by the Pand’it Jayanārāyaṇa Tarka Panchānaṇa, who added to it a gloss of his own; and some of the sūtras have been translated by the late Dr. Ballantyne (Mirzapore, 1851). Of later works on the same system, may be mentioned the *Bhāṣāpariṣekhā*, edited with the commentary called *Siddhāntamuktāvalī*, and translated by the late Dr. Roer in the *Bibliotheca Indica* (Calcutta, 1850), and the popular *Tarkusāgraha* in several editions; edited also and translated by Dr. Ballantyne (2d edit., Calcutta, 1848), who in his preface gives a catalogue of the commentaries which this work has elicited. The reader not acquainted with Sanskrit is, for further information on the subject, referred to these translations, and to the essays on the Vaiśeṣhika system by H. T. Colebrook (*Miscellaneous Essays*, vol. i., Lond. 1837), and prof. M. Müller, in the 6th and 7th vols. of the *Zeitschrift der deutschen morgenländischen Gesellschaft*.

VAISHNAVAS is the name of one of the three great divisions of Hindu sects. See INDIA, section *Religion*. The word, derived from *Vishn’u* (q.v.), designates the worshippers of this deity, and comprises a great variety of sects; but this variety itself differs according to different periods of the medieval history of India, old divisions becoming

extinct, and new ones taking their place. Thus, the account of the Vaishn'avas, as given in a celebrated work of *Anandagiri*, the *Sankara-dig-vijaya*, or the victory of the great theologian Sankara over his religious adversaries, would no longer apply in detail to the present condition of the Vaishn'avas; and even some of those varieties mentioned by the late prof. Wilson in his *Sketch of the Religious Sects of the Hindus*, written in 1832, would seem to have disappeared already in our days. The common link of all the sects comprised under the name of Vaishn'avas, is their belief in the supremacy of Vishn'u over the other gods of the Trimūrti (q.v.). Their difference consists in the character which they assign to this supremacy, and to the god Vishn'u himself in the religious and other practices founded on the nature of their belief, and in their sectarian marks. The following sects belonging to this category may especially be noticed here.

1. The *Rāmānujas*, or *Srī Vaishn'avas*, or *Srī-Sampradāyins*. They derive their origin from *Rāmānuja*, a celebrated reformer, who was born at Perumbur, in the s. of India, about the middle of the 12th c., and is considered by his followers as an incarnation of *Sesha* (q.v.), the serpent of Vishn'u. He studied at Conjeveram, resided afterward at Srīranga, and then traveled over different parts of India, where he was especially engaged in combating the professors of different creeds, particularly the Śaivas. On his return to Srīranga, he was seized by the king Kerikāla Chola, but effected his escape, and found refuge with the Jain king of Mysore, Vitāla Deva, whom he converted to the Vaishn'ava faith. For 12 years he then remained at Mysore; but at the death of the Chola king, returned to Srīranga, where he spent the remainder of his life in religious seclusion. The *Rāmānujas* address their worship to Vishn'u and his consort, Lakshmi (q.v.), and their respective incarnations, either singly or conjointly. Hence their sect consists of corresponding subdivisions, according as Nārāyaṇa or Lakshmi, or Lakshmi-Nārāyaṇa, or Rāma, or Sītā or Sītā-Rāma, or any other incarnation of these deities, is the preferential object of the veneration of the votary. Their most striking peculiarity is the preparation and the scrupulous privacy of their meals; for should the meal during its preparation, or while they are eating it, attract even the looks of a stranger, the operation is instantly stopped, and the viands buried in the ground. The marks by which they distinguish themselves from other sects are two perpendicular white lines, drawn with a white earth, *gopichandana*, from the root of the hair to the commencement of each eyebrow, and a transverse streak connecting them across the root of the nose; in the center is a perpendicular streak of red, made with red sanders, or a preparation of tumeric and lime; other marks, representing several of the attributes of Vishn'u, they have either painted or impressed on the breast and each upper arm; and, besides, they wear a necklace of the wood of the Tulasi (holy basil), and carry a rosary of the seeds of the same plant, or of the lotus. The sacred formula with which a member of this sect is initiated into it consists merely of the words *Om rāmāya namaḥ*, "Om, salutation to Rāma." Their principal religious tenet is the belief that Vishn'u is the cause and creator of all the worlds; that he and the universe are one, though he is of a twofold form, the supreme spirit or cause, and the gross one, the effect or matter. In distinction from the Vedānta, with which their doctrine has otherwise many points of contact, they regard their supreme deity as endowed with qualities, all of which are of course excellent; and teach that the universe consists of *chit*, thinking or spirit, *achit*, unthinking or matter, and *īśvara*, or god; the relation of which is that of enjoyer, the thing enjoyed, and the ruler of both. The deity, they assume, is or has been visibly present in five modifications, in the objects of worship, as images, etc.; in the incarnations (see under VISHN'U); in certain forms called Vyūhas, viz., Vāsudeva or Krīṣṇa; Balarāma, Pradyumna, and Aniruddha; and in the subtle form which comprises six qualities—absence of passion, immortality, exemption from pain or care, absence of natural wants, love, and practice of truth—and the human soul; all of which have to be worshiped serially, as the votary ascends in the scale of perfection. The chief authoritative works in Sanskrit of this sect are the *Vedānta Sātras*, with several commentaries, several works on the Vedānta (q.v.) philosophy, the *Pancharātra* of Nārada; of Purāṇas (q.v.), the *Vishn'u*, *Nārāyaṇa*, *Garud'a*, *Padma*, *Varāha*, and *Bhāgavata-Purāṇa*; and besides, the works of *Venkat'a*, and several popular works on the dialects of the south. It is in the s. that the followers of Rāmānuja, and their temples and establishments, are still numerous; in the n. of India, where they are better known as *Srī Vaishn'avas*, they are not of frequent occurrence.

2. The *Rāmānandas Rāmāvats*. They are by far the most numerous class of sectaries in Gangetic India: in the district of Agra, they alone constitute seven-tenths of the ascetic population. They belong chiefly to the poorer and inferior classes, with the exception of the Rajputs and military Brahmans. The founder of this sect was *Rāmānanda*, who, by some, is considered to have been the immediate disciple of Rāmānuja; by others, the fifth in descent from that teacher, when he would have lived about the end of the 13th c.; but other more reliable accounts place him toward the end of the 14th, or the beginning of the 15th century. According to common tradition, Rāmānanda seceded from the Rāmānujas to whom he originally belonged, because, having spent some time in traveling through various parts of India, and in consequence having been suspected by his fellow-disciples not to have conformed to the rule of the Rāmānujas in taking his meals, he was condemned to feed in a place apart from the rest of them, but did not acquiesce in the affront thus offered him. His residence was at Ben-

ares, at the Pancha Gangâ Chât', where a *math*, or monastery, of his followers is said to have existed. The especial object of their worship is Vishn'u, in his incarnation as *Râmachandra*, and his consort *Sitâ*, and, as amongst the Râmânujas, these deities either singly or jointly. Some members of this sect also pay adoration to other forms of Vishn'u; and the religious mendicants of the sect consider all form of adoration superfluous, being content with the incessant invocation of Krishn'a and Râma. Their practices are less precise than those of the Râmânujas; but the most important difference between them consists in the fact that Râmânanda abolished the distinction of caste among the religious orders, and taught that a *Vairâgin*, or one who quitted the ties of nature and society, shook off at the same time all personal distinction. The initiatory formula of Râmânanda is *Srî Râma*, or "blessed Râma." Their sectarian marks are the same as those of the Râmânujas, except that the red perpendicular streak on the forehead is varied in shape and extent, and generally narrower than that of the Râmânujas. Their are various subdivisions of this sect, believed to have been founded by several eminent disciples of Râmânanda. Their doctrines vary often from that of the latter, but they maintain an amicable intercourse with the Râmânujas and with each other. The twelve chief disciples of Râmânanda were *As'ânand*, *Kabîr*, *Raidâs*, *Pipâ*, *Sursurânand*, *Sukhânand*, *Bhavadânand*, *Dhavanâ*, *Sena*, *Mahânand*, *Paramânand*, and *Srî Anand*; and besides these *Nâbhâji*, the author of the *Bhaktamâlâ*, *Sâr-Dâs*, *Tulasî-Dâs*, the translator in Hindi of the *Râmâyan'a*, and the author of many popular works which exercise a considerable influence on the Hindu population, and the poet *Jayaadeva*, the author of the *Gitagovinda*. Many legends, of course, are related of these personages, especially in the *Bhaktamâlâ*, the favorite work of this sect.

3. The *Kabîr Panthis*. The founder of this sect, one of the most interesting and important in upper and central India, except, perhaps, in Bengal itself, was Kabîr, the most celebrated of the twelve disciples of Râmânanda before mentioned, who, therefore, probably lived about the end of the 14th century. The circumstances connected with his birth, life, and death are all related as miraculous; and so little is certain about his life that even the Mussulmans claim him as one of their persuasion. But his great controversy with the Hindu *Sâstras*, and his limited knowledge of the Mohammedan authorities, render such a supposition highly improbable. According to the doctrine of this sect, there is but one God, the creator of the world; but, in opposition to the *Vedânta* (q.v.), they assert that he has a body formed of the five elements of matter, and a mind endowed with the three *gunas*, or politics; he is of ineffable purity and irresistible power, eternal, and free from the defects of human nature, but in other respects does not differ from man. The pure man is his living resemblance; and after death, becomes his equal and associate. God and man are therefore not only the same, but both in the same manner everything that exists. For 72 ages, God was alone; he then felt the desire to renew the world, which desire assumed the shape of a female form; and this form is, *Mâyâ* (q.v.), or illusion, with whom he begot the triad, Brahman, Vishn'u, and S'iva. He then disappeared, and *Mâyâ* approached her offspring in order to frame the universe. Vishn'u hesitated to associate with her, and is therefore more respected by the Kabîr Panthis than the other two gods of the triad; but the latter were frightened by her, and the result of their submission was the birth of *Sarasvatî*, *Lakshmi*, and *Umâ*, whom she wedded to the three deities to produce the world. To understand the falsehood of *Mâyâ* is, therefore, the chief aim of man; and so long only as he is ignorant of the source of life, he is doomed to transmigration (q.v.), which, according to the belief of this sect, is also extended to the planetary bodies—a falling star or meteor being a proof, for instance, that it undergoes a fresh change. The moral code of the Kabîr Panthis is, in many respects, creditable to them. Life, they teach, being the gift of God, must not be violated by his creatures. Humanity and truth are two of their cardinal virtues; retirement from the world is deemed desirable; and implicit devotion, in word, act, and thought, to the guru, or spiritual teacher, a supreme duty. But, as regards the latter point, it is characteristic that the pupil is enjoined first to scrutinize the teacher's doctrine and acts, and to be satisfied that he is the sage he pretends to be, before he resigns himself to his control. It is no part of their faith to worship any deity, or to observe any ceremonies and rites of the Hindus; but they are recommended outwardly to conform to all the usages of tribe and caste, and some even pretend to worship the usual divinities, though this is not considered justifiable. They have no peculiar mode of dress, and though some wear the sectarian marks of the Vaishnavas, and the necklace and rosary, all these outward signs are considered of no importance. Though, therefore, properly speaking, they can scarcely be included amongst the Vaishnava sects, yet their paying more respect to Vishn'u than to any other god of the Trimûrti (q.v.), and the fact of Kabîr having been a disciple of Râmânanda, also the friendly intercourse which they maintain with most of the Vaishnava sects, cause them always to be looked upon as belonging to them. The doctrines of Kabîr are taught in a great variety of works in different dialects of Hindi, all of which are the acknowledged compositions of his disciples and successors. The principal are the *Sikhsîs*, 5,000 in number, consisting of one stanza each; the *Bijak*, in 654 sections; and the *Sukh Nidhân*. The sect itself is split into a number of subdivisions, and twelve branches of it are traced to the following personages: *Srutgopâl Dâs*, the author of the *Sukh Nidhân*—his successors preside over the Chaura at Benares; *Bhâgo Dâs*, the author of the *Bijak*;

Nārāyaṇ Dās and *Churāmaṇ' Dās*, the two sons of a merchant at Jabbalpur; *Jaggo Dās*, of Kuttack; *Jivan Dās*; *Kamāl*, of Bombay; *Tāk Sālī*, of Broda; *Juānī*, of Majjhī, near Sahāsrām; *Sāheb Dās*, of Cuttack; *Nityānand*, and *Kamāl Nāḍ*, in the Dekhan. The principal establishment of the sect is the Kabir Chaura at Benares.

4. The *Vallabhāchāryas*, or *Rudra Sampradāyins*. The original teacher of this sect is said to have been *Vishṇu Svāmīn*; but it is a later successor of his, *Vallabha Svāmīn*, or *Vallabha Achārya*, who, from the influence which his teaching and writing exercised on the propagation of his doctrines, must be considered the real founder of this sect. He was born in 1479, in a forest called Champāraṇ'ya, where his parents deserted him on a pilgrimage they had undertaken to Benares. The gods, of course, took care of the infant, and his parents, who recovered him afterward, took him to Gokula, a village on the left bank of the Jumna, a short distance from Mathura, where he received his first education. In his twelfth year he left this place in order to propagate throughout India his tenets, which at that time, it must be understood, he had already framed. On arriving at a certain town in the s. of India, he became acquainted with a person of influence, *Damoraḍās*, whom he converted to his doctrine. Both of them then proceeded together to the city of Vijayanagar, where the maternal parents of Vallabha resided. He was now introduced to the court of the king of Vijayanagara, Krishṇ'adeva, and succeeded so well in his disputation with the S'aivas and Smārta Brāhmins that not only the king bestowed on him rich presents, but the Vaishṇavas elected him as their chief, with the title of *Āchārya*, or spiritual teacher. He then traveled to Ujjayin, Allahabad, and Benares, and from there for 9 years through different parts of India, until, on his return to Brindāva, as a reward for his exertions and faith, he was honored by a visit from the god *Kṛishṇa* in person, who enjoined him to introduce his worship, and to found the religion now so widely diffused throughout western India under the sectarian name of *Rudra Sampradāya*. Vallabha ultimately settled at Benares, and there composed 17 works in Sanskrit, the most important of which are a commentary on the *Vedānta* (q.v.) and *Mimāṃsā* (q.v.) *Sūtras*, and one on the *Bhāgavata Purāṇa*; works, however, only intended for the learned, and now very rare. He died on a hill in the vicinity of Benares, in his 53d year, after having made 84 devoted disciples. He was succeeded by his second son, *Vithalnāthji*, who was born in 1516, in the village of Parnāt, and is known amongst the sect by the designation of *S'ri Gosāin Jī*, his father Vallabha's sectarian name being *S'ri Achārya Jī*. *Vithalnāthji* died in 1583, and left besides four daughters, seven sons, who were all teachers, and formed as many communities, viz., *Gīrdharji* (born 1540), *Govinda Rīy* (born 1542), *Bālkr'ishṇ'aji* (born 1549), *Gokulnāthji* (born 1551), *Ragunāthji* (born 1554), *Jadunāthji* (born 1556), and *Ghanashyamji* (born 1561). It was, however, *Gokulnāthji* who became the most celebrated of the descendants of *Vithalnāthji*, for to him especially is due the vitality of this sect, and even to the present day the followers of his descendants consider their own Gosāins the only legitimate teachers of their faith, while even the adherents of the other sons of *Vithalnāthji* pay them the greatest respect. It is about the period when the sons of *Vithalnāthji* dispersed that they first acquired the title of *Mahārāj*, or "great king," by which the chiefs of this sect are now best known, though besides this proud designation they have other distinctive titles, such as *Vallabha Kula*, *Agni Kula*, *Guru*, etc. The heads of the *Gokulnāthji* division of this sect are usually called *Gokul Gosāins*, or *Gokulastha Gosāins*. The members of this sect are widely diffused throughout Bombay, Cutch, Kattywar, and central India, and especially the province of Malwa. Their establishments and temples are numerous throughout India, especially at Mathura, Brindāvan, and Benares. The most celebrated of all is at *S'ri Nāth Dwār*, in Ajmeer, and the members themselves belong to the better and wealthier classes of the Hindu community. At present there are about 60 or 70 "Mahārajas" of this sect dispersed over India, 8 or 10 of whom reside at Bombay alone, and 15 or 16 at Gokul. But so much degenerated are they as a body, that only 2 or 3 of them have any knowledge of Sanskrit; the rest, as a distinguished writer on this sect, Mr. Karsandās Mulji, asserts, being grossly ignorant; for, as Wilson remarks, it is a curious feature in the notions of this sect that the veneration in which the Gosāins are held is paid solely to their descent, and unconnected with any idea of their sanctity and learning; and that, though they are not unfrequently destitute of all pretensions to individual respectability, they nevertheless enjoy the unlimited homage of their followers.

The chief authority of the sect is the *Bhāgavata Purāṇa* (q.v.), and after it the works of Vallabha and various books, 74 in number, 39 of which are translations from Sanskrit, and the rest original compositions in the Brijbāshā dialect. The object of their adoration is *Vishṇu* (q.v.) in his incarnation as *Kṛishṇa*, whose residence is Goloka, far above the three worlds. There he originally lived alone, but in meditating on the works of creation, created a female form, which became the primary agent in creation: This was *Māyā*. He then produced crude matter, the five elements, and all the divine beings; the gods of the Trimūrti, their female consorts, and 300,000,000 of Gopis, or cowherdesses, who are the especial attendants on *Kṛishṇa*. The principles of the sect, as laid down by Vallabha, are the following ten: 1. To secure the firm support of Vallabhāchārya; 2. To exercise chiefly the worship of *Kṛishṇa*; 3. To forsake the sense of Vaidik opinion and be a suppliant to *Kṛishṇa*; 4. To sing praises with feelings of humility; 5. To believe that Vallabha is a Gopi, or mistress of *Kṛishṇa*; 6. To swell the heart with the

name of Kr'ishn'a; 7. To forsake his commands not for a moment; 8. To put faith in his words and doings; 9. To adopt the society of the good, knowing them divine; and, 10. To see not the faults, but speak the truth. Out of this code, however, grew up the doctrine that the Guru or Mahārāj is the impersonation of Kr'ishn'a himself, that God and the Guru are necessarily to be worshiped, and that the sectary is bound to bestow on him "his body, organs of sense, life, heart, and other faculties, and wife, house, family, property, with his own self." The gross abuse which was made of this tenet became apparent in a very remarkable trial, the so-called Mahārāj libel case, which took place in 1861 in the supreme court of Bombay, and revealed the licentiousness of one of the then Mahārājas of the sect of Bombay; the defendant sued for libel by this Mahārāj being a highly respected and distinguished member of the sect, Mr. Karsandās Mulji, who had had the courage of calling, in a native newspaper, on the Mahārājas to reform and to return to the ancient Hindu faith, and whose public conduct on that occasion elicited the highest praise of the court, and, it is to be hoped, initiated a better era of this sect. The temples of the sect have images of Kr'ishn'a, and Rādhā, his principal wife; the former representing a chubby boy, of a dark hue, who is richly decorated, and eight times a day receives the homage of his worshipers. The ceremonials which on those occasions take place are the *mangala*, or morning levee, about half an hour after sunrise, when the image is washed and dressed, and presented with refreshments; the *s'ringāra*, when the image having been anointed and perfumed, holds his public court—this takes place about an hour and a half after the preceding; the *grāla*, 48 minutes after the last, the image being now visited preparatory to its going out; the *rājabhogā* held at mid-day, when Kr'ishn'a is supposed to have come home from the pastures and sat down to dine—all sorts of delicacies are then placed before the image, and distributed to the votaries present; the *utthāpāna*, three hours before sunset, when the god is summoned to get up from his siesta; the *bhoga*, or afternoon meal, about half an hour later; the *sandhyā*, about sunset, or the evening toilet of the image; and the *s'ayanā*, or retiring to repose, about 7 in the evening; the image then being put upon a bed and refreshments being placed near it, when the votaries retire, and the temple is shut till the ensuing morning. Besides these ceremonies, there are other annual festivals observed by this sect throughout India; of these the *Rath Yātra*, or procession of the god in a chair, is the most celebrated in Bengal and Orissa; the most popular at Benares is the *Jaunāshtamī*, or the nativity of Kr'ishn'a; and the *Rās Yātra*, or annual commemoration of the dance of Kr'ishn'a with 16 Gopis—a very popular festival, at which all kind of rejoicings take place. The mark on the forehead of the Vallabhāchāryas consists of two perpendicular lines meeting in a semi-circle at the root of the nose, and having a round spot of red between them. On the breasts and arms they have the same marks as the Rāmānujas, made with a black earth called *Syāmabandī*, or any black metallic substance; their necklace and rosary are made of the stalk of the Tulasi (holy basil) plant. For a fuller account of this sect, its authorities, festivals, and worship, and the practices of the Mahārājas, see the interesting *History of the Sect of Mahārājas or Vallabhāchāryas in Western India* (by Karsandās Mulji—London, 1866), which also contains the history of the "Mahārāj Libel Case" above referred to.

5. The *Mādhvāchāryas* or *Brahma Sampradāyins*. This sect occurs especially in the peninsula, and was founded by a Braham, *Mādhvāchārya*, who is looked upon by his followers as an incarnation of Vāyu, the god of wind, after having been incarnate in preceding ages as Hānumat (q.v.) and Bhima. He was born in the year 1199, and educated in a convent at Anantes'war. In his ninth year he was initiated into the order of anchorites by Achyuta Pracha, a descendant of Śanaka, a son of Brahman. At that early age he composed a commentary on the Gītā; then traveled to the Himālaya, and, when returned, erected at Udipi the image of Kr'ishn'a, which had been originally made by Arjuna, and miraculously recovered by him. In addition to the principal temple at Udipi, he established eight other temples in Tuluva, below the Ghāts; composed, it is related, 37 works, and, on a controversial tour, triumphed over various divines. In his 79th year he went to Badarikāśrama, where, the legend says, he continues to reside with Vyāsa, the compiler of the Vedas and Purāṇas. It seems that he was originally a priest of the Śaiva faith, and one of his names, *Ananda Tīrtha*, even indicates that he belonged to the class of Das'nami Gosāins, who were instituted by *Sankarāchārya* (q.v.). He encouraged, therefore, an attempt to form a kind of compromise between the Śaivas and Vaishnavas; and in the temples of his sect, images of Śiva are allowed to partake of the worship offered to those of Vishn'u. Votaries of the Mādhwa Gurus and of Sankarāchārya Gosāins offered also the reverential obeisance to their teachers mutually, and the latter visit the temple of the former to perform their adoration at the shrine of Kr'ishn'a. The essential dogma of this sect is the identification of Vishn'u with the supreme soul, as the pre-existent cause of the universe; and this primeval Vishn'u they affirm to be endowed with real attributes, and, although indefinable, to be most excellent and independent. But besides this independent, there is also a dependent, principle; for besides the supreme soul, *Paramātmān*, there is a living soul, *Jivatman*, which is dependent on the supreme; and though indissolubly connected with, yet not the same with him. In consequence, they deny the absorption of the human soul into the universal spirit, and the loss of independent existence after death. In this respect they differ, therefore, on a vital point of doctrine, from the members of other Vaishnava and

Saiva sects. The manner in which they conceive the universe to have issued from the Supreme Being is to a great extent analogous to that of the other Vaishnavas; and they also receive the legends of the Vaishnava Purāṇas relating to the birth of Brahman, from the lotus, which grew out of the navel of Viṣṇu, etc. The modes of worshipping Viṣṇu they declare to be three: marking the body with his symbols, especially by means of a hot iron; giving his names to children and objects of interest; and the practice of virtue in word, act, and thought. That in word consists in telling the truth, giving good counsel, mild speaking, and study; that in act comprises liberality, kindness, and protection; and clemency, freedom from envy, and faith are the practice of virtue in thought. Final liberation, or freedom from future birth, they consider as the reward for having secured the favor of Viṣṇu by sedulously worshipping him; and those who have attained it enjoy felicity in Viṣṇu's heaven, under one or all of the four conditions: of being similar to him in form, of remaining in his visible presence or in his proximity, and of sharing equal power with him.

Their worship is not materially different from that of the other Vaishnavas, except in one peculiarity, which proves that they have a friendly learning toward the Saiva sect; for the images of Śiva, Durgā, and Gaṇeśa are placed by them in the same shrine as Viṣṇu. The Gurus, or superiors, of this sect are Brahmans and ascetics, or profess cenobitic observances; the disciples live in their *maths*, or monasteries, and profess also perpetual celibacy. The lay votaries of these teachers are members of every class of society except the lowest. The Gurus adopt the external appearance of ascetics, laying aside the Brahmanical cord, carrying a staff and water-pot, going bareheaded, and wearing a single wrapper of an orange color. The marks common to them and the lay votaries are the symbols of Viṣṇu upon shoulders and breast, and the frontal mark, consisting of two perpendicular lines made with the white clay *Gopichandana*, and joined at the root of the nose, like that of the Rāmānujas; but instead of a red line down the center, they make a straight black line with the charcoal from incense offered to Nārāyaṇa, terminating in a round mark made with turmeric. The scriptural authorities of this sect are, besides the writings of its founder, the four *Vedas*, the *Mahābhārata*, the *Panchārātra*, and the original *Rāmāyaṇa*.

6. The *Vaishnavas of Bengal*, the far greater number of worshippers of Viṣṇu, in Bengal, form one-fifth, or according to another estimate, nearly one-third of the population of this province. Their founder, *Chaitanya*, was the son of a Brahman settled at Nadiya, but originally from Silhet. He was born in 1485, and his birth was accompanied by the usual potentous indications, described in Hindu legends, of a superhuman event. He was, in fact, an incarnation of Kṛṣṇa, who appeared for the purpose of instructing mankind in the true mode of worshipping him in this age. Up to his 24th year Chaitanya seems to have lived without any great pretensions to sanctity; he married, it is said, a daughter of Vallabhāchārya, and supported his mother after the death of his father, which occurred in his childhood. At twenty-four, however, he shook off the obligations of society, and became an ascetic, traveled between Mathurā and Jagannāth, and taught his doctrine. At the end of his peregrinations, he nominated his two principal disciples, *Advaitānand* and *Nityānand*, to preside over the Vaishnavas of Bengal, and *Rūpa* and *Sanātana* over those of Mathurā. Chaitanya himself then settled at Cuttack, where he remained twelve years, engaged in teaching and controversy, and in intent meditation on Kṛṣṇa. There he had frequent visions of Kṛṣṇa, Rādhā, and the Gopis, and in one of these fits of ecstasy, was nearly drowned in the Jumna. Ultimately, he disappeared—how, is not known—about 1537. Of his two chief disciples, *Advaitānand* resided at Sāntipur, and seems to have been a man of some property and respectability. *Nityānand* was a resident of Nadiya, and a householder, and his descendants are still in existence. Besides these three Prabhus, or chiefs, the Vaishnavas of Bengal acknowledge six Gosāins as their original teachers, viz., *Rūpa*, *Sanātana*, *Jiva*, *Raghunāth Bhaṭṭa*, *Raghunāth Dās*, and *Gopāl Dās*; and next to them they hold in veneration *Srinivāsa*, *Guddāhar Pan'dit*, *Śrī Śeṣarūpa*, *Rāmānand*, and others including *Hārīdās*, who especially obtained almost equal honor with his master Chaitanya. In addition to these chiefs, the sect claims eight eminent poets, among whom *Kṛṣṇa Dās* is the most celebrated. According to the doctrine of the sect, *Kṛṣṇa* is the supreme spirit, who, for various purposes, assumed specific shapes, in which he became incarnate (see *Viṣṇu*); and so far there is not much real difference between the tenets of this and other Vaishnav sects. But an important innovation, introduced by its founder, is the doctrine of *Bhakti*, or faith, which, he teaches, is infinitely more efficacious than abstraction, than knowledge of the divine nature—as enjoined by the philosophical systems—than the subjugation of the passions, than the practice of the Yoga, than charity, virtue, or anything deemed most meritorious. A consequence resulting from this doctrine is, that all castes become by such faith equally pure, and therefore that all castes are admissible into the sect; that all are at liberty to sink their social differences in the condition of ascetics, in which character they may live with each other without regard to former distinctions, and that all members of the sect are equally entitled to the food which has been previously presented to the deity. The *Bhakti*, or faith, comprehends five stages: quietism, as that of sages; servitude, which every votary takes upon himself; friendship for the deity, such as is felt by Bhīma and others honored with his acquaintance; tender affection for the deity, of the same nature as love of parents for their

children; and the highest degree of affection, such passionate attachment as the Gopīs felt for their beloved Kṛiṣṇa.

The manner of expressing these feelings in acts of divine worship is about the same as that represented by the ceremonial of the Vallabhāchāryas; but the secular worshippers are generally content with paying their homage twice a day to the idol of Kṛiṣṇa. Their chief ritual is a very simple one; it consists of constantly repeating the name of Kṛiṣṇa—a practice of which one of their chiefs, Haridās, set them a remarkable example, as during many years, when he resided in a thicket, he repeated the name of Kṛiṣṇa 300,000 times daily. Their other duties are sixty-four, including many moral and many absurd observances, as suppressing anger, avarice, and lust, and singing and dancing in honor of Kṛiṣṇa, and fasting every eleventh day. The most important of all their obligations, however, is their servile veneration of the spiritual teacher, whom they are bound to look upon as the deity himself, and even as possessed of more authority; for they are taught that "the prayer is manifest in the Guru, and the Guru is Viṣṇu himself," again: "First, the Guru is to be worshiped, then I (Viṣṇu) am to be worshiped;" and, "when Viṣṇu is in anger the Guru is our protector; but when the Guru is in anger, we have none." In this respect, the doctrine of the Vaiṣṇavas of Bengal is similar to that of the Vallabhāchāryas, and their practice also agrees in so far as the Vaiṣṇavas look upon the dignity of their Gurus as hereditary, and not depending on personal capacity or sanctity; but, as in the case of the Vallabhāchāryas, this practice does not appear to have been enjoined by their original teachers. Liberation from terrestrial existence, most votaries of this sect do not conceive in the spirit of the Vedānta, which teaches that final deliverance is the absorption of the human soul into the divine essence; but, in their opinion, it is twofold, either perpetual residence of the soul in Swarga, or paradise, with possession of the divine attributes of power, etc.; or elevation to *Vaikuṇṭha*, the heaven of Viṣṇu, where they enjoy felicity under one or all of the four conditions, under which also the Madhvacāryas conceive such felicity to exist. Chaitanya and his two chief disciples did not leave, as it seems, written compositions; the rest of his pupils, however, wrote numerous works in Sanskrit and Bengali. The Vaiṣṇavas of this sect are distinguished by two white perpendicular streaks of sandal, or *Gopāchādana*, down the forehead, uniting at the root of the nose, and continuing to near the tip; by the names of *Rādhā-Kṛiṣṇa* stamped on the temples, breast, and arms; by a close necklace of Tulasi stalk of three strings, and a rosary of 108 or sometimes 1000 beads made of the stem of the Tulasi. The sectaries consist of every caste and order, and are governed by the descendants of their Gosāins: some live in a state of celibacy; the teachers, however, are married men.

There are several divisions of this sect, arising from the various forms under which Viṣṇu is worshiped: but besides them, there are three which may be looked upon as seceders from the original sect—viz., the *Spāṣṭa Dāyukas*, the *Kartā Bhājas* and the *Sāhujas*.

The *Spāṣṭa Dāyukas* deny the divine character and authority of the Guru, and allow the association of male and female cenobites in one conventional abode, where their relation is that of brothers and sisters, and their common interest the worship of Kṛiṣṇa and Chaitanya. The women act also as the spiritual teachers of the females of respectable families, and the consequence is the growing diffusion of the doctrines of this sect in Calcutta, where it is especially established. The *Kartā Bhājas* are of very recent origin, and, as they acknowledge the absolute divinity of the Guru, there would not be much difference between them and the original body of the Vaiṣṇavas of Bengal, had they not broken through the old line of hereditary teachers, and invested a new family with spiritual power—viz., that of their founder, *Rāma-Saran-Pāl*, who at the beginning of this century, was successful in his attempt to create this schism. Of the *Sāhujas*, very little is known, their professions and practices being kept secret. These are suspected not to be of a very moral character. The chief temples of the Vaiṣṇavas of Bengal are at Dwarakā, Brindāvan, Jagannāth, Nediya, Ambikā, and Agratwipa.

Besides the Vaiṣṇava sects, there are others of less importance, which it must here suffice merely to enumerate by name—viz., the sect of the *Khākins*, founded by *Kā*, the disciple of Kṛiṣṇadās, and established chiefly at Hanumāngādhi, in Oude; the *Mālūkt Dāsas*, founded by *Mālūkt Dās* about 1600, or at the end of the emperor Akbar's reign—their principal establishment is at Kara Manikpur; the *Dādū Panthis*, founded by *Dādū*, a pupil of one of the Kabir teachers, about the same time, and established especially in Marwar and Ajmeer; the *Rai Dāsas*, founded by *Rai Dās*, a disciple of Rāmānanda, a sect, it is said, confined to the very lowest of the mixed Hindu castes, or the workers in hides and leather; the *Senā Panthis*, who derive their origin from *Senā*, the barber, the third of Rāmānanda's disciples; the *Mirā Bissas*, a subdivision of the Vallabhāchāryas, established by *Mirā Bāi*, the daughter of a petty Rājā of Mertā, and the wife of the Rājā of Udayapur; the *Sanakīdi Sampradāyins* or *Nimārats*, throughout upper India, founded by an ascetic Nimbāditya; the *Rādhā Vallabhis*, who consider Hariṁas' as their founder, a personage who lived about 300 years ago, and established a monastery at Brindāvan; the *Sekhī Bhāras*, probably owing their origin to the last-mentioned sect; the *Charan' Dāsas*, whose chief seat is at Delhi, founded by *Charan' Dās*, a merchant of the Dhāsar tribe, who resided at Delhi, in the reign of the second Alamgir; the *Harid'chandis*; the *Sudhā Panthis*, founded by *Sudhā*, a butcher; and

the *Mādhavis*, founded by *Mādho*.—For a fuller detail, see H. H. Wilson's *Sketch of the Religious Sects of Hindus*, edited by Dr. Rost in Wilson's works, vol. i. (Lond. 1862); and on the Vallabhāchāryas, the *History of the Sect of the Mahārājas* (by Karsandās Mulji), mentioned above (Lond. 1865).

VALAIS (Ger. *Wallis*), a frontier canton of Switzerland, bounded on the n. by the cantons of Vaud and Bern, and on the s. by Italy. Area, 2,020 sq. m.; pop. '76, 100,490. It forms one long and deep valley, included between two of the loftiest mountain chains of Europe—the Pennine and the Bernese Alps—and is drained by the Upper Rhone, which, rising at its north-eastern extremity, in the glacier of the Gallenstock, falls at the western boundary of the canton into the lake of Geneva. No European territory is more completely isolated by mountains; and it is rendered still more inaccessible by transverse chains, between which are inclosed narrow valleys. The greater part of the surface consists of barren mountain slopes; in their higher elevations, covered with the greatest of the Swiss glaciers. The forests and pasture-lands supply the inhabitants with their chief occupations. But grain-cultivation is not absent; the chief agricultural tract being the level ground, from a quarter of a m. to 3 m. wide, which lies along the main channel of the river. Here corn enough is grown to supply the wants of the inhabitants. The heat at the bottom of the valley is intense in summer, and Indian corn and the vine are grown with great success. The Valais opens into the lake of Geneva, and is connected by great high-roads, and now by railway, with the other parts of French Switzerland and Savoy. The Grimsel and Gemmi passes connect the eastern part of the valley with German Switzerland; and the Great St. Bernard and Simplon (q.v.) passes connect it with Italy. Formerly the cattle, the chief export of Valais, were driven over the Simplon into Italy; but now the railway, which ascends the valley to beyond Sion, on the Simplon road, threatens to divert this trade to western Switzerland and France. The inhabitants of the upper Valais—one-third of the population—speak German; those of the lower Valais, the Vaudois dialect of French. The line which separates the two languages lies along the ridges running n. from the Matterhorn to a point a little to the e. of Leuk. All the inhabitants are Roman Catholic. The Valais is subdivided into *dixaines*, each of which has its council, and may be said to form a republic. Each of the *dixaines* sends four members to a larger council or diet meeting at Sion. The upper part of the Valais, throughout the middle ages, acknowledged a very slight feudal dependence on the German empire; the lower part belonged to Savoy. At the period of the struggle of the Swiss with the duke of Burgundy, the upper Valais took possession of the lower Valais, and reduced it to the position of a vassal state; and in this condition it remained until 1798, the period of French conquest, when the distinction was set aside. As stated in the article SWITZERLAND, under the recent constitution, the suffrage was extended to the whole population of Valais, with results little expected by the liberal party in the Swiss diet. Sion (q.v.) and Martigny (q.v.) are the chief towns.

VALCKENAER, LUDVIG KASPAR, an eminent Dutch philologist, b. at Leeuwarden in 1715, studied at Franeker, and in 1741 became professor of Greek there. Subsequently, he was called to Leyden, where he died, March 14, 1785. Valckenaer was an admirable lecturer and commentator on the classics. To a thorough knowledge of their literature and antiquities he added a fine critical discernment and thoughtfulness. Among his more notable performances are his recasting of Ursinus's *Virgilius cum Scriptoribus Græcis Collatus* (Leeuwarden, 1747), his editions of the Greek grammarian Ammonius (Leyd. 1739; Leip. 1822), of the *Phænissæ* (Franck. 1755; Leip. 1824), and the *Hippolytus* (Leyd. 1768; Leip. 1823), his *Diatrise in Euripidis Perditorum Dramatum Reliquias* (Leyd. 1767; Leip. 1824); his edition of the so-called *Epistles of Phalaris* (Gröning. 1777), and of the *Idylls of Theocritus* (Leyd. 1779–81; new ed., Leip. 1810). He also furnished a rich store of critical observations to Wesseling's Herodotus. Among his posthumous works are his *Callimachi Elegiarum Fragmenta* (Leyd. 1799), his *De Aristobulo Judæo* (Leyd. 1806), and his *Opuscula Philologica, Critica, Oratoria* (2 vols., Leip. 1808).

VALDAI HILLS. See NOVGOROD.

VALDEPEÑAS, a t. of New Castile, in the modern province of Ciudad Real, and 30 m. e.s.e. of the city of that name. It is a straggling mud-built town, situated in a district celebrated for its red wine. The wine, when obtained pure, which it seldom is except at Valdepeñas, is rich, fruity, full-bodied, high-colored, and will improve for 10 years. Pop. 11,300.

VALDÉS, JUAN DE, 1500–40; b. Spain; went to Germany, and was converted to the principles of the reformation, though he seems to have been no partisan, but to have sought the unity of the faith; resided at Naples, and became secretary to the king; united there with some friends in the study of the Bible, and wrote some commentaries and religious books. After his death his friends were accused by the inquisition of forming a new sect, called Valdesians, some of whom were put to death, others fled to foreign countries. Some of his works, published by an English Quaker, were: *Dos Dialogos; Alfabeto Cristiano; Dialogo de la Lengua; La Epistola de San Pablo á los Romanos i la I á los Corintios, ambas traduzidas i comentadas*.

VALDIVIA, a fertile, generally level province in s. Chili, covered largely by timber, and drained by the Cauten, Totten, Valdivia, and Río Bueno rivers; 10,700 sq. m.; pop.

'76, 37,181—two-thirds Indian, the rest Spanish and mixed; bounded n. by province of Aranco, e. by Andes, s. by Llanquihue, w. by the Pacific, on which it has fine harbors. Valdivia formerly yielded gold largely, but the tyranny of the Spaniards in imposing slavery on the natives led to revolt and the ruin of the mines. In the Andes region are several volcanoes; the highest, Villarica, 16,000 ft. high. The climate is moist but healthful. Capital, Valdivia.

VALDIVIA, PEDRO DE, 1505-59; b. Spain; went with Pizarro to Peru; participated in the conquest of Venezuela, 1535; aided Pizarro in subduing the rebellion under Almagro; conquered Chili, 1540; founded Santiago, 1541, and Coquimbo, 1544; upon the murder of Francisco Pizarro, was recalled to Peru; appointed capt.gen. of Chili, and of whatever countries s. of Peru he might conquer; founded the cities of Concepcion, Villa Imperial, Villa Rica, in 1551; conquered the Araucanians, who afterward took him prisoner and put him to death.

VÀLEI, a name given to the plantain in southern India. See **PLANTAIN**, *ante*.

VALENCE, a t. of France, capital of the dep. of Drome, in a charming situation on the flank of a hill that borders the left bank of the Rhone, 65 m. s. of Lyons by railway. The walls with which it is surrounded give it a gloomy appearance. Silk-weaving and silk-throwing are carried on, manufactures of printed and other cottons, and commerce in silk, fruits, wines, liquors, and spirits. Pop. '76, 20,476.

VALENCIA, a small island on the s.w. coast of Ireland, forms part of the county Kerry, is separated from the main land by a narrow arm of Valencia bay, and lies 38 m. s.w. from Killarney. It is $5\frac{1}{2}$ m. long and 2 m. broad; the soil is in many places good; half the entire area is under cultivation; and there are about 2,500 inhabitants. On the w. side, which is mainly high rocky moorland, there are valuable slate and flag quarries. On the n. side of the island is Valencia bay, an inlet of Dingle bay; and Valencia harbor, the most western in Ireland, is part of the bay of the same name. Here is the telegraphic station for three Atlantic cables, now in operation, which were laid in 1866, '73, and '74, besides the cable laid in 1865, but which is not now in operation. Another Atlantic cable starts from Balinskellig bay, a little to the s. of Valencia. See **TELEGRAPHY** and **ATLANTIC TELEGRAPHY**.

VALENCIA, a former kingdom of Spain, now subdivided into three modern provinces of Valencia, Alicante, and Castellon de la Plana (see **SPAIN**), comprises a tract of country in the e. of Spain, washed by the Mediterranean, and bounded on the n. by Catalonia, and on the s. and s.w. by Murcia.

In the middle districts of the kingdom are small plains, abounding in lagoons where they border on the Mediterranean, but furnished with few harbors; both in the n. and s. are mountain ridges, offsets from the eastern edge of the great central plateau of Spain. Valencia is remarkable for its fine climate, and for its fertility in the well-watered districts. The fruitful localities called the *huertas* (gardens) yield three, and sometimes four harvests in the year. Neither wheat nor barley is largely grown, but the rice-crops are so abundant, that not only is the whole of Spain supplied with this article from Valencia, but a considerable quantity is also exported. The country is rich in iron, lead, copper, cinnabar, cobalt, and coals. The lagoons on the coast, especially that of Albufera, are rich in sea-fowls and fish. The inhabitants, in whom is observable a strong mixture of Moorish blood, are remarkably industrious, and Valencia is known to be the most actively manufacturing province of Spain after Cataluña.

VALENCIA, a co. in New Mexico, divided nearly into two portions by the southern projection of San Miguel co.; about 10,500 sq.m.; pop. '79, 9,093. Capital, Valencia.

VALENCIA, an ancient city and sea-port of Spain, formerly capital of the kingdom, and now of the province of the same name, stands on the shores of the Mediterranean, 294 m.e.s.e. of Madrid by railroad. The Huerta—35 English sq.m. in extent—which surrounds the city resembles an immense orchard, and is ingeniously watered by an intricate network of pipes and rivulets, laid down by the Moors eight centuries ago, and efficiently answering its purpose down to the present day. In this garden, the carob, citron, orange, palm, and mulberry grow in wild luxuriance. Nature, stimulated by constant moisture and a burning sun, exhibits a wonderful strength and fecundity. Valencia is surrounded by old picturesque battlemented walls, erected by Pedro IV. in 1356; the interior of the city is striking and pleasing; most of the streets are macadamized; and while, in the old quarters, the houses are closely packed and gloomy-looking, well suited to keep out the enemy: *heat*—those recently erected are high, gayly colored in blue, rose, cream-color, etc.; decorated with elegant iron-gilt balconies, and furnished with courts freshened with flowers and cooled by fountains. Valencia is the see of an archbishop, and its cathedral, La Seo—the see—which was commenced in 1262, is classical in the interior, and Gothic in the exterior, is 350 ft. long, and at the transepts, 216 ft. wide. From the top of a tower which surmounts one of the portals, the view is said to be one of the most striking in Spain. In the cathedral and its chapels there are a number of magnificent pictures, including some by Ribalta and Joanes. The church of the Colegio de Corpus is quite a museum of pictures by Ribalta, who, according to Ford, has

painted heads equal to any produced by the old Venetians. There are also numerous and interesting picture-galleries, in the chief of which only the productions of the great Valencian school are to be seen. The custom-house, dating from 1758, is now the cigar factory, which employs 3,500 women, and produces 120,000 lbs. of tobacco yearly. The university, with a public library of 42,000 vols., is well attended. Silk-spinning and weaving are extensively carried on. There are also extensive hemp and cloth weaving, and manufactures of hats, glass, linen, leather, and Valencia tiles for flooring. Valencia was long sunk, like the whole of the country, in a lethargic sleep, but it has, within recent years, awakened to activity. Its port has been improved; it is now connected with Madrid by railway, and being to its own metropolis what Brighton is to London, it is much visited in summer by the *Madridenos*, who contribute greatly to its prosperity. There is considerable commerce with Britain. Pop. about 110,000.

Valencia, or *Valentia de Cid*, is a very ancient city. It was destroyed by Pompey, and rebuilt by Sertorius, after which it became a *colonia*. It was taken by the Goths in 413 A.D., and by the Moors in 712. The *Cid* took it in 1094-95, and ruled despotically here till 1099. The union of Ferdinand and Isabella brought it under the Castilian crown. Suchet captured the city in 1810.

VALENCIA, a t. of South America, Venezuela, in the province of Caracas, 85 m. w. s.w. of Caracas, about 2 m.e. of a lake of the same name, and about 20 m. from Puerto Cabello on the coast, with which and with Caracas it carries on an active trade. Valencia is finely situated in an exceedingly fertile district, in which cattle and horses are raised in great numbers. Pop. said to be 16,000.

VALENCIENNES, a manufacturing t. and fortress of France, in the department of Nord, on the Escaut, 155 m. by railway n.n.e. of Paris. It is well built, but it does not contain many objects of attraction of any sort. There are many pleasant promenades in the immediate vicinity. A famous kind of lace is made here, as well as fine woven fabrics and gauzes. Salt-making and sugar-refining are carried on, and there is an active trade in timber, wine, and oil. It is the birthplace of Watteau and Froissart. Pop. 76, 22,686.

VALENS, Emperor of the East, the brother of Valentinian I. (q.v.), was born near Cibalis in Pannonia, about 328 A.D., and was associated with his brother in imperial authority, receiving as his share of the empire, Asia, Egypt, and Thrace, March 28, 364. His sovereignty was, however, disputed by Procopius, a supposed scion of the race of Constantine, who raised his standard in Thrace, was crowned at Constantinople, and for two years maintained his ground with skill and courage, till the defeat of his troops at Thyatira and Nicosia, and his subsequent capture and cruel death, 366 A.D. The first prominent act of Valens's reign was a reduction of 25 per cent in the taxes, which gained him the general good-will of his subjects, but was of questionable prudence in the unsettled state of the northern and eastern frontiers. The prolonged imprisonment of 3,000 Ostrogoths, who had been sent to aid Procopius, led to a rupture between Valens and the aged hero Hermanric, and to a war which lasted from 367 to 369. The contest was carried on in the country of the Goths, and was throughout in favor of the Romans. Difficulties arose immediately afterward (370) with the Persians, who were desirous of possessing themselves of Armenia, and though the two powers came frequently into collision, the one as the assailant, and the other as the ally of the Armenian monarch, war was not declared till the end of 372, when the Romans were victorious. Valens, who had removed to Antioch at the commencement of the war, now occupied himself with the religious quarrels between the Arians and the orthodox party, which at that time raged with much violence over the whole eastern empire. Incapable of independent judgment, he had adopted the views of his Arian counselors, and under their guidance, punished the more obstinate of the "heretics." At the same time, a conspiracy, prompted by professors of magical arts, who declared that Valens's successor should be one whose name began with *Theod*, was discovered, its promoters and agents punished with death, as well as a number of persons who were so unfortunate as to possess a name commencing with the unlucky prefix. Affairs on the eastern frontier again assumed a threatening aspect; but the Romans were disinclined any longer to interfere with the designs of the Persians on Armenia, and concluded a somewhat discreditable treaty in 376. In the mean time, events were taking place on the northern frontier which were destined ere long to become of sinister import to the Roman empire. The Goths, who had for some time been peacefully settled in Dacia, were assailed by the advancing hordes of the Huns; the Ostrogoths, who first felt the shock, were partly incorporated, and the remainder forced to retreat; the Visigoths next attempted to stem the torrent, but without success, and immense crowds of fugitives belonging to this warlike race crowded to the n. bank of the Danube. Valens accorded permission to a large body of Goths under Fritigern to cross into Mœsia and Thrace, and take possession of the waste lands in these provinces; the fugitive Ostrogoths soon afterward crossed the river without permission; and the alarm which the numbers and turbulence of his new subjects speedily aroused led Valens to the adoption of such impolitic measures, that the gratitude of the Goths for shelter afforded was turned to bitter resentment. Valens, prompted by his servile and flattering advisers, at last resolved on war; and marching against the barbarians, he engaged them near Adrianople, Aug. 9, 378. His

army was totally routed, and two-thirds of it, including Valens himself and most of his chief officers, left dead on the field.—See Gibbon's *Decline and Fall*, chaps. 25 and 26; Tillemont's *Histoire des Empereurs*, vol. v.

VALENTINE, BASIL, a celebrated German alchemist, of whom so little is known that it has been disputed whether he flourished in the 12th or the 15th century. It has been maintained that he was a monk of the order of St. Benedict, in St. Peter's convent at Erfurt, but his name does not appear on the list at Erfurt, nor on the general list kept at Rome. It seems probable that he flourished about the end of the 15th century. He was a diligent seeker for the philosopher's stone, and wrote a large number of works, chiefly on the process of transmutation, a complete list of which will be seen in Lenglet's *History of the Hermetic Philosophy*, vol. iii. Some of the titles are curious, as *Basil Valentine's Twelve Keys of Philosophy*; *Apocalypsis Chymica*; *Revelation of the Mystery of the Essential Colors of the Seven Metals*; *The Triumphal Car of Antimony*; *A Chymico-philosophical Tract concerning Things Natural and Preternatural*, etc. After his death, his works were thought to be wholly lost, when they were discovered in the stonework of the abbey, "heaven itself conspiring to bring to light these extraordinary works by shattering by a thunderbolt the pillar in which they were concealed," if we are to believe his followers in the mystic art, who have handed the story down to us. His works were mostly written in the old Upper-Saxon dialect, and were not printed till 1662; after which time many of them were published in the form of French translations, though a few still remain in MS.

VALENTINE'S DAY, the 14th of February, is, or more correctly was, celebrated in England, Scotland, and in different parts of the continent, particularly Lorraine and Maine in France, by a very peculiar and amusing custom. On the eve of St. Valentine, a number of young folk—maids and bachelors—would assemble together, and inscribe upon little billets the names of an equal number of maids and bachelors of their acquaintance, throw the whole into a receptacle of some sort, and then draw them lottery-wise—care, of course, being taken that each should draw one of the opposite sex. The person thus drawn became one's valentine. Of course, besides having got a valentine for one's self, one became, by the universality of the practice, some other person's valentine; but, as Misson, a learned traveler in the early part of last century, remarks, "the man stuck faster to the valentine that had fallen to him, than to her to whom he had fallen." These imaginary engagements, as may readily be supposed, often led to real ones; because one necessary consequence of them was that, for a whole year, a bachelor remained bound to the service of his valentine, somewhat after the fashion of a mediæval knight of romance to his lady-love. At one period it was customary for both sexes to make each other presents, but latterly the obligation seems to have been restricted to young men. During the 15th c. this amusement was very popular among the upper classes, and at many European courts. From Pepys's *Diary*, we see that in Charles II.'s reign, married as well as single people could be chosen.

For some time back, the festival—at least in England and Scotland—has ceased to possess the graceful symbolic meaning it used to have, and has become a considerable nuisance. "The approach of the day is now heralded by the appearance in the print sellers' shop-windows of vast numbers of missives calculated for use on this occasion, each generally consisting of a single sheet of post-paper, on the first page of which is seen some ridiculous-colored caricature of the male or female figure, with a few burlesque verses below. More rarely, the print is of a sentimental kind, such as a view of Hymen's altar, with a pair undergoing initiation into wedded happiness before it, while Cupid flutters above, and hearts transixed with his darts decorate the corners. Maid-servants and young fellows interchange such epistles with each other on the 14th of February, no doubt conceiving that the joke is amazingly good; and, generally, the newspapers do not fail to record that the London postmen delivered so many hundred thousand more letters on that day than they do in general."—Chambers's *Book of Days*, vol. i. p. 255.

The connection of the custom with St. Valentine is purely accidental. In the legends of the different saints of that name recorded in the *Acta Sanctorum*, no trace of the practice peculiar to the 14th of February is found. It has been suggested by Mr. Doane, in his *Illustrations of Shakespeare*, that the custom may have descended to us from the ancient Romans, who, during the *Lupercalia*, celebrated in the month of February, were wont, among other things, "to put the names of young women into a box, from which they were drawn by the men as chance directed;" and that the Christian clergy, finding it difficult or impossible to extirpate this pagan practice, gave it at least a religious aspect by substituting the names of particular saints for those of the women; and it is certainly a usage more or less widely extended in the Roman Catholic church to select, either on St. Valentine's day or some other, a patron saint for the year, who is termed a valentine. But it is far more probable that the custom of choosing valentines is a relic of that nature-religion which was undoubtedly the primitive form of religion in N.W. Europe—as elsewhere; and that it sprung from a recognition of the peculiarity of the season. Hence the explanation, that "about this time of the year the birds choose their mates, and thence probably came the custom of the young men and maidens choosing valentines or special loving friends on that day." Valentines are now extensively manufactured, the demand being yearly on the increase.

VALENTINIANS, a gnostic sect or school (see **GNOSTICS**), founded by Valentinus, who went from Alexandria to Rome about 140 A.D., and died there, or in Cyprus, about 160. The distinguishing feature of his system lies, in the first place, in his recognizing heathenism as a preparatory stage of Christianity; and then in his dividing the higher spiritual world into 15 pair of æons, each consisting of a male and a female. The first pair, or syzygy, is made up of Bythos, or God in himself, and Ennoia, or God as existing in his own thoughts; from these emanated next Nous (Intelligence) and Aletheia (Truth), and so on. As the last æon, Sophia, transgressed the bounds that had been laid down by the æon Heros, and a part of her being became lost in Chaos, there was formed a crude being, called Achanroth, which, through the Demiurgos that emanated from it, created the corporeal world. Heros now imparted to the souls of men (for all the bodies composing the corporeal world are possessed of souls) a *pneumatic* or spiritual element, but this only attained to full activity when Christ, a collective emanation from all the æons, appeared as Saviour, and united himself with the man Jesus. In the end, all that is pneumatic, and even the originally psychic or soul element in as far as it has assimilated itself to the psychic, will return into the Pleroma.

VALENTINIA NUS, the name of three Roman emperors of the same family; the first and most famous of whom, **VALENTINIANUS, I.**, was the son of a Gratianus (a rope-maker who had enlisted in the army, and risen to the grade of *comes militum*), and was born at Cibalis, in Pannonia, 321 A.D. Valentinianus entered the army at an early age, and, aided by the military renown of his father, rapidly rose in rank under the emperors Constantius and Julian, only, however, to fall more rapidly; for he was degraded by Constantius in 357, and, for his publicly expressed contempt for paganism, banished by Julian in 362. Restored to favor in the following year, he distinguished himself in the e., and on the death of Jovian, was unanimously chosen as his successor, Feb. 26, 364. A month after his accession, he chose as his colleague his brother, Valens (q.v.), to whom he resigned the government of the e., reserving for himself Illyricum, Italy, the Gauls, Britain, Spain, and Africa. During **VALENTINIANUS's** reign, the utmost vigilance was required to preserve the frontier districts of the empire from the ravages of the swarms of barbarians who, like vultures, had gathered round their prey, watching with greedy eagerness the rapid decay of its strength, and ready at the first opportunity to hasten its impending doom. The Alemanni repeatedly (366-68) ravaged the e., and the Saxons (370) the north-east of Gaul; Illyricum was wasted (370) by the Quadi, and Africa by the southern desert tribes; and though these invasions were mostly repelled and revenged in a manner becoming the warriors of the queen of nations, the auxiliary means often had recourse to (e.g., the assassination of two powerful and able opponents, the kings of the Alemanni and Quadi, and the treacherous attack on the Saxons while under the fancied security of a treaty), surely indicated that the sturdy virtue which formerly imbued the soldiers of the empire was rapidly disappearing. The internal administration was excellent, for the emperor added to his ability, prudence, and firmness of character, the less common imperial qualities of vigilance and impartiality; and his cognizance of any abuse or injustice by whomsoever perpetrated, was the signal for its speedy rectification, and the severe punishment of the offender. Though himself a zealous Catholic, he repelled the solicitations of the bishops who wished him to interfere in the religious disputes of the time, permitted his subjects to adopt whatever religion they chose, and strictly forbade all persecution or annoyance on account of religious belief, even retaining the "pontifices" of the provinces in the privileges which they had possessed under Julian. On account of the scandalous abuse by ecclesiastics of their influence over their penitents, he excluded priests and monks from the right of succession to property; judicial proceedings were forbidden to be held in private; the extreme license of speech hitherto allowed to advocates was judiciously restrained; gratuitous medical attendance was provided for the poor of Rome; and schools were established throughout the empire. The success of **VALENTINIANUS's** administration was doubtless much owing to his fortunate choice of officers: Theodosius the elder in Africa and Britain, Jovinus in Gaul, and Theodosius the younger (afterward emperor) in Illyricum, form a trio distinguished by an unswerving loyalty, administrative ability, and military talent, rarely found in any age; and contrast strongly with their predecessors in office. **VALENTINIANUS's** private life was a model of morality and economy; and according to the summation of the accurate and trustworthy Ammianus, "he had so many good qualities, that if everything had been equal in him, he would have been another Trajan or Marcus Aurelius." But the one and grievous fault which marred his character was an ungovernable temper, which led him into the occasional commission of excessive cruelties, and ultimately caused his death; for while giving audience to the deputies of the Quadi, with whom he was then at war, he worked himself into such an access of passion as to rupture a blood-vessel in his chest, and fell back dead into the arms of his guards, Nov. 17, 375. By his first wife he had one son, Gratianus (q.v.); and by the second, Justina, another son, Valentinian, and three daughters, one of whom, Galla, became the wife of the emperor Theodosius I.—**VALENTINIANUS II.**, the younger son of the preceding, was born 372 A.D., and received from his elder brother, Gratianus (q.v.), the provinces of Italy, Illyricum, and Africa, as his share of the western empire. During his long minority, the empress Justina,

administered the government; and about three years after her death, Valentinianus, who had given promise of good administrative qualities, was murdered by the Frank, Arbogastes, the commander-in-chief of his army, May 15, 392.—VALENTINIAN III., the grand-nephew of the preceding, being the son of Constantius III. by Placidia, the daughter of Theodosius the great and Galla, was born about 419 A.D. and was seated on the throne of the west by Theodosius II., emperor of the east, 425 A.D. Valentinian was a weak and contemptible prince, nevertheless his reign is one of the most interesting epochs of Roman history, exhibiting, as it does to the full, the internal weakness and corruption of the empire, the gradual closing with it of its irresistible barbarian foes; the sad picture being momentarily lightened from time to time with a flash of the warrior-spirit of old Rome. Valentinian may be said never to have ruled during the 30 years that he sat disesteemed and unhonored on the imperial throne; his mother, Placidia, governed till her death in 450, and was succeeded by the eunuch, Heraclius, one of those malignant fribbles who swarmed around the throne of the falling empire. The regulations enacted for the internal administration were creditable, and especially so when ecclesiastical interests were involved, as in almost all cases, the ambitious and persecuting tendencies of the now preponderant orthodox party, were firmly restrained; while, on the other hand, the fierce vindictiveness of its more bigoted rivals was kept within bounds. But the utter corruption of manners, the complete extinction of "public spirit," the oppressive exactions of the tax collectors, and equally of the commissioners who were appointed to prevent these exactions; the general employment of the powers of the executive in the avenging of private quarrels, and the utter impossibility of obtaining redress for injuries, too plainly showed that the empire had fallen far beyond remedy, and that if not destroyed by assailants from without, it would speedily crumble to pieces of itself. The early part of Valentinianus's reign was disturbed by the contests between the "comites" Boniface and Aëtius, the former of whom had supported, and the latter resisted Valentinianus's claims to the throne; but notwithstanding this, the vile and groundless calumnies of Aëtius prevailed upon the empress to declare the gallant and upright governor of Africa a public enemy; and the latter, in the first flush of resentment, called to his aid the Vandals under Genseric (q. v.). Thus Africa was lost to the empire. But Aëtius, notwithstanding, proved himself the invincible bulwark of the Roman power in Europe; the Franks, Goths, Burgundians, and other German nations who had encroached on the empire, were successively defeated and repelled, and the destructive career of the formidable Huns brought nigh to a close on the field of Chalons. Yet the labor of defending an extensive empire from attack on all sides was too much for one man; and consequently, much of Spain and Gaul was ultimately seized by the Suevi and Visigoths, the n. of Italy was ravaged by the Huns, Sicily and Sardinia by the Vandals, and even Rome repeatedly besieged, while Britain was abandoned to the wild Picts and Scots. Aëtius seems to have committed the same error as his more upright and noble, though not more able, predecessor Stilicho (q. v.), in attempting, by the marriage of his son to Valentinianus's daughter, to transfer the imperial dignity to his own family, and like him also, undermined in influence and reputation by the machinations of a eunuch, he was assassinated, though by the sword of his master (454). In the following year, Valentinianus, who had ravished the wife of his intimate friend Maximus, was conspired against by the friends of the latter, and the faithful adherents of Aëtius, and murdered in the midst of his guards, March 16, 455.

VALENZA, *Valentia Valentinum Forum*, a city of Northern Italy, on an elevated plain, on the right bank of the Po, 8 m. n. of Alessandria. It is very regularly built, and commands a fine view of the surrounding vine-clad hills. It carries on a trade in wine, and manufactures of silk, flax, and hemp fabrics. Pop. '71, 8,918.

Valenza, a very ancient town, belonged to the Liguri, and was conquered by Marcus Fulvius, the pro-consul, who named it *Forum Fulvii, quod Valentinum*. In 1635 it was besieged for 50 days by the armies of France, Savoy, and Parma, and taken. In 1707 it came into the possession of Victor Amadeus II., duke of Savoy; in 1805 the French destroyed its gates and fortifications; and in 1815, after the fall of Napoleon's empire, it reverted to the king of Sardinia.

VALERIAN, *Valeriana*, a genus of plants of the natural order of *valerianaceæ*, an order of exogenous plants, containing nearly 200 known species, natives of temperate climates, chiefly of Europe, the mountainous parts of India, and South America; annual or perennial herbaceous plants with opposite leaves, destitute of stipules, and small flowers in cymes. They are nearly allied to *dipsacaceæ* (see TEASEL), but differ in the mode of inflorescence, and in the seeds being destitute of albumen. The fruit also is not simply 1-celled, but exhibits two other abortive cells, and the stamens are 1-5, the stigmas 1-3. The corolla is sometimes spurred.—The genus *valeriana* is distinguished by a pappus-like calyx, a spurless corolla, and three stamens. The species are pretty numerous. The common valerian (*V. officinalis*) is abundant in ditches, moist woods, etc., in Britain and throughout Europe. It has a fleshy root, pinnatifid leaves, a stem 2-4 ft. high, and pale flesh-colored flowers. The root is a well-known medicine, used both by physicians and as a domestic remedy in spasms, epilepsy, hysteria, and other nervous affections. It possesses powerful antispasmodic properties, and a very considerable influence over the nervous system. Cats are very fond of it, and it exercises a

remarkable stimulating and intoxicating power over them. Although the plant grows chiefly in damp soils, the root is most powerfully medicinal in dry hilly ground.

The roots should be collected in autumn; and those from wild plants growing on a dry soil are preferred. The chief ingredients of valerian are woody fiber, resinous and gum-like matters, and a little more than one per cent of a volatile oil, which is crystallizable, and has been termed *valerole*, and in which a well-known acid (also obtained from several other sources), *valerianic* or *valeric acid*, is developed on exposure to the air. Valerian imparts its therapeutic properties, which are those of a stimulating antispasmodic agent, both to water and to alcohol. There are three official preparations—viz., the *infusion*, the *tincture*, and the *ammoniated tincture*. In large doses, valerian produces considerable disturbance of the nervous system, as headache, vertigo, and even temporary blindness. In average doses—as, for example, in from one to two ounces of infusion, and from half a dram to two drams of either of the tinctures—it is a very efficacious remedy in those severe cases of hysteria which closely simulate epilepsy, and in chorea. As some of the salts of valerianic acid—viz., the valerianates of soda, zinc, ammonia, iron, and quinine—act similarly to and with more certainty than the above-named preparations, we may infer that the therapeutic action of the remedy is solely due to the acid; and as the infusion and tinctures are by no means agreeable medicines, they will probably soon be replaced by the valerianates.

The SMALL MARSH VALERIAN (*V. dioica*), also a native of Britain, is much less powerful than the common species.—The greater valerian (*V. phu*), which grows in alpine districts of the continent of Europe, is now almost entirely disused, although it is said to be one of the strongest of the European valerians, a pre-eminence which *V. dioscoridis* disputes with it.—*V. Cellica* and *V. saluinea* are gathered near the limits of perpetual snow on the mountains of Styria and Carinthia, and carried into Turkey and Egypt, and thence into India and Ethiopia, to be used to aromatize baths, and as a substitute for Spikenard (q.v.).—*V. sitchensis*, a native of the n.w. of America, is said to possess the medicinal properties of the genus in great perfection. *V. Hardwickii* is used medicinally in Nepal.—The root of *V. edulis*, a species found in the n.w. of America, is an article of food of the Indians.—Corn salad (q.v.) or lamb's lettuce belongs to the order *valerianaceae*.

VALERIANEL'IA. See CORN SALAD.

VALERIA'NIC or **VALERIC ACID** is one of the volatile fatty acids represented by the general formula $\text{HO}, \text{C}_n\text{H}_{2n-1}\text{O}_2$, or $\text{C}_n\text{H}_{2n}\text{O}_4$. Its composition is represented by the formula $\text{HO}, \text{C}_{10}\text{H}_9\text{O}_2$; and among its chief properties it may be noticed that it is a limpid, colorless, oily fluid of a penetrating odor, allied to that of valerian root, and an acrid taste. It renders paper transparent, but the spots disappear on exposure to the air. Its specific gravity is 0.94, it boils at 247° , and may be distilled without change; and its vapor is inflammable. It is only slightly soluble in water, but dissolves in alcohol and ether in all proportions. It exists in and is obtained by distilling valerian root with water acidulated with sulphuric acid. It may be similarly obtained from angelica root, and some other vegetable sources. It is also formed during the oxidation of fats and fatty acids (especially oleic acid), either by nitric acid or mere exposure to the air, by the oxidation and putrefaction of the albuminates, etc., but the best method of procuring it is by distilling a mixture of amylic alcohol (or fousel oil) with bichromate of potash and sulphuric acid.

The salts of valerianic acid—the valerianates or valerates, as it is now becoming the fashion to call them—are formed either by saturating the base or its carbonate with the free acid, or by double decomposition, their general formula being $\text{MO}, \text{C}_{10}\text{H}_9\text{O}_2$, when M is any metal. The alkaline valerianates are very soluble, and are not easily obtained in crystals; but most of the other salts occur in nacreous scales, and all of them, when moist, have the smell and taste of valerian.

The following salts are used in medicine: *valerianate of soda*, which is included in *pharm. Br.* *valerianate of zinc*, which is also included in *pharm. Br.*, and occurs in brilliant white pearly tabular crystals, with a feeble odor of valerianic acid and a metallic taste, is scarcely soluble in cold water or in ether, but insoluble in hot water and alcohol. Besides these official salts, the valerianates of ammonia, of iron, and of quinia are employed in the same cases as the preparations of valerian, the doses averaging from half a grain to three or four times that amount three times a day in pills, except in the case of the ammonia salt, which is best given in solution. *Valerianate of oxide of amyl* ($\text{C}_{10}\text{H}_{11}\text{O}, \text{C}_{10}\text{H}_9\text{O}_2$) is a volatile fluid with a penetrating odor of apples, boiling at about 360° , slightly soluble in water, but dissolving freely in spirit and in ether. In the form of a dilute spirituous solution, it so strongly resembles apples in its smell, that it is used in perfumery under the title of *oil of apples*.

VALERIA'NUS, P. LICINIUS, Roman emperor, was descended from an ancient and noble family, and after distinguishing himself in the various posts which he was selected to fill by masters who appreciated his talents and virtues, was chosen for his integrity and accomplishments to the office of censor. Faithful in his allegiance to Gallus, he went to summon the legions of Gaul and Germany to aid the feeble emperor against the usurper Æmilianus, but arrived too late to save his master. The usurper's troops, awed by the superior numbers of Valerianus's army, and the stern sanctity of their leader's

character, murdered their own chief, and united with their late antagonists in proclaiming Valerianus emperor, 253 A.D. Valerianus was then about 60 years of age, and feeling his inability to sustain, unaided, the cares of empire, assumed as colleague his eldest son, Gallienus (q.v.). Valerianus showed abundant proof during his short reign of most ardent zeal for the prosperity of the empire; but the times required a ruler of more energy and ability; as the grave disturbances which arose throughout the empire, the irresistible irruption of the Franks into Gaul, despite the utmost efforts of Aurelian (q.v.), the devastation of Thrace, Macedonia, Greece, and the archipelago by the Goths, the advance of the Alemanni to Milan, and the conquest of Syria and Armenia by Shapur, amply testified. The troubles in the e. appearing most threatening, Valerianus went thither in person, and for some time fortune favored his standard; but pursuing his opponents too rashly, he was suddenly attacked by superior numbers at Edessa, completely defeated, and himself, with the remnant of his army, forced to surrender, 260 A.D. The statements regarding the indignities heaped upon the unfortunate captive by his haughty conquerer, are probably false, or, at least, much exaggerated; but of one thing we are assured, that Valerianus languished till death in hopeless captivity; and after his death, his skin was flayed off, stuffed, preserved as a proud trophy of victory, which was invariably exhibited to the ambassadors from Rome to the Sassanide court.

VALERIUS MAXIMUS, a Roman historical compiler of the reign of Tiberius, his work bearing the title of *Factorum et Dictorum Memorabilium*, Libri IX, and consisting of short stories and anecdotes from various authors. His style is ornate and often obscure, and his want of acquaintance with the history and constitution of his country renders him an unsafe guide; yet he was a favorite author of his own time, and much studied in the middle ages. The best edition is that of Halm, Leipsic, 1865.

VALETTA, an important fortress and beautiful city, capital of the island of Malta, on the n.e. side of which, in lat. 35° 53', long. 14° 31', it is situated. It occupies a tongue of land, which runs out in a n.e. direction, is 3,200 yards long, and generally about 1200 yards across, except at the extremity, where it narrows considerably, and forms the famous point of St. Elmo, on which are a powerful fort and a light-house. From this point to its landward end, the neck of land, which is well named the "Hog's Back," rises gradually; and there is a downward slope from the central ridge to the Great harbor on the right, and to the Marsa-Muscet, the quarantine harbor, on the left. Eight principal streets traverse the peninsula, and are intersected by cross-streets, that pass over the central ridge, and afford communication from harbor to harbor. These cross-streets are necessarily very steep at the extremities, where they rise from the shores by long flights of stairs. The town and harbors are defended by a series of fortifications of great strength. They are mostly hewn out of the solid rock, and, mounted with the most powerful artillery, are considered impregnable. The city is divided into five quarters—the *Citta Nuova*, or Valetta proper, Floriana, Vittoriosa, Sanglea, and Barmola. Besides the enormous forts, balconies, and battlements, which are the principal architectural characteristics of the city, Valetta contains many noble edifices. The governor's palace—formerly that of the grand masters—is unadorned without, but magnificent within, and possesses an interesting armory: the "con-" (i.e., joint) cathedral of St. John is a superb structure; and the church of San Pubblio, with its famed *sofferaneo* (vault) of embalmed monks and skeletons; the public library, 60,000 vols.; the university; and the aqueduct, which brings water to the city from the far side of the island, a distance of 8½ miles, are worthy of notice. The city was founded by the grand master Valette—from whom it derives its name—in 1566. Valetta is the center of the commerce of the island, for which, as well as for the principal historical incidents with which its name is associated, see MALTA. Pop. upward of 60,000.

VALETTE, JOHN PARISOT DE LA, a grand master of the knights of St. John, celebrated for his gallant defense of Malta against a powerful fleet of the Turks, which must be regarded as mainly instrumental in checking the westward progress of the arms of Solymán the great, long the terror of Europe and of Christendom. La Valette was born of a noble family, in 1494; and at a very early age entered the order of St. John, in which he soon distinguished himself by his enthusiastic bravery and his skill in arms. His chief distinctions, even in youth, were won in the naval service in the Mediterranean, where the Turkish power was especially formidable. On the death of Claude la Sangle, grand master of the order, La Valette was elected to that office, being the 48th in the list of the grand masters. Still directing the energies of the order in the same course, he succeeded, within the first five years of his grand-mastership, in capturing 50 great galleys from the Turks, and an immense number of smaller vessels of war; a success which so stirred the indignation of the sultan, that he resolved on the capture of Malta, and the destruction of the knights. Accordingly, on May 18, 1565, an immense fleet, of 159 ships, conveying a body of 30,000 janizaries and spahis, appeared off the harbor of Malta, and after failing in several assaults, formally invested the island. Alone and unsupported by any of the Christian powers, the gallant La Valette maintained the fortress under circumstances of extreme difficulty and distress of every kind; and when, all further resistance seeming to be hopeless, he was urged to capitulate, his reply was, that the life of a worn-out soldier of 71 years could not be better spent than in such a service. At last, at the end of four months, and after a loss, it is said, of 20,000 men,

the Turkish fleet was forced to raise the blockade and withdraw from the island. LA VALETTE died three years later, Aug. 21, 1568.—There is another LA VALETTE, a father of the Jesuit society, who obtained a very different sort of notoriety in the latter half of the 18th century. Having engaged, contrary to the prohibition of Benedict XIV., as a trader in the products of the large estates held by the Jesuits in the Philippine islands, and being unable, in consequence of the capture of his ships by an English privateer, to meet his engagements, a suit was commenced in the French courts against the French province of the society, the proceedings in which suit were among the causes which precipitated the expulsion of the society from France, and its eventual suppression by Clement XIV. See JESUITS.

VALGUARNE'RA, a t. of Sicily, in the province of Caltanissetta, 48 m. n.e. of Girgenti, in a mountainous district. Pop. about 9,500.

VALGUS is a term employed in surgery to designate a variety of club-foot (q.v.). The corresponding Latin word signifies "having legs bent outward, bow-legged," and is probably derived from *volvo*, "to turn or twist." As it is an adjective, the substantive, *talipes* (an unclassical word, indicating "weakness of the feet," but in surgical nomenclature signifying "club-foot") must be regarded as understood.

VALLA, LAURENTIUS, one of the first scholars of the renaissance, was b. at Rome in 1415, taught classics in various places in the north of Italy; but in 1443, on account of his assaults on the scholastic philosophy, and his defense of Epicurus, found it advisable to seek protection at Naples from Alfonso V. Here, however, he soon fell under a suspicion of heresy, and was, it is said, dragged for punishment before the inquisition. Aided by the king, he made his escape, and fled to Rome, where pope Nicholas V. pardoned him, received him into favor, and appointed him papal secretary and canon in the church of St. John Lateran. He died 1465. Valla's Latin translations of Herodotus (Par. 1510) and Thucydides (Lyon, 1543) are admirable, and had a great influence in spreading a knowledge of classic history; but the work that brought him most renown was the *Elegantie Latini Sermonis* (6 books; Rome, 1471), which long served as a model in style to Latinists. From 1741 to 1836, no fewer than 59 editions of it appeared. It has passages of noble eloquence in praise of the glorious tongue of Rome, through which one discerns a passionate desire for the unity of Italy—that now attained aspiration of Italian scholars and writers. The *Elegantie* is, moreover, full of nice grammatical observations, particularly on synonyms. Valla has also the credit of being the first of the renaissance scholars that used his classical culture in the criticism of the New Testament (*Annotationes in Novum Testamentum*, published by Erasmus). In his *De Donatione Constantini Magni*, he demonstrated the historical groundlessness of the pretended "Donation" of Constantine, and inveighed against the popes for their grasping after temporal power; but this he was forced to retract. A collected edition of Valla's works appeared at Basel in 1543.

VALLABHA and **VALLABHĀCHĀRYAS**. See under VAISHN'AVAS.

VALLADOLID', a famous city of Spain, sometime capital of the whole country, and still capital of the province of the same name (see CASTILE), stands on a wide, wind-blown plain on the left bank of the Pisuerga, 150 m. n.w. of Madrid by railway. It is 2,100 ft. above sea-level, and has a healthy climate, the air being pure and genial, and the sky generally cloudless. Having been the residence of the court prior to its removal to Madrid at the close of the 16th c., the city contains many large and decayed dwellings; although, with the returning prosperity of the town, new mansions are being erected, and the streets are being paved, enlarged, and multiplied. In the plaza de Campo, the site of famous tournaments, *autos-da-fé*, decapitations, and bull-fights, Napoleon reviewed 35,000 troops. The plaza de Toros, or bull-arena, can accommodate 10,000 persons. The museum, which contains such of the statues, carvings, and sculptures as could be collected at the suppression of convents in the province, is an elegant building, containing a grand saloon, six rooms filled with pictures, and three with sculptures. Of these treasures, the sculptures are the most valuable, though among the pictures are several by Rubens. Near the palacio real (royal palace), are the remains of two of the noblest Gothic religious edifices in the world, the convent of San Pablo, and the Colegio de San Gregorio, both richly and beautifully decorated, but much damaged by the French soldiery. Valladolid is admirably situated for trade and manufactures. There is abundant water for irrigation, and the surrounding district is remarkably fertile. It communicates with the Atlantic by the Douro, and with the middle and south of Spain by canals and railways. Manufactures are springing up in the city; the soil in the vicinity is being improved by companies instituted for that purpose; and in other respects Valladolid gives tokens of revival. Silk, cotton, and woolen stuffs; jewelry, hats, paper, perfumery, etc., are manufactured. Pop. about 50,000.

Valladolid, the *Pincia* of Ptolemy, is first mentioned under its present name in 1072. Charles V. erected many splendid edifices here. About this time Valladolid was the most prosperous city in Spain, containing 100,000 inhabitants. Formerly capital of Castile and Leon, it was still the residence of the kings and the usual resort of foreigners. In 1560 Madrid was declared the only court; and from this time the prosper-

ity of Valladolid declined. Since 1851 it has been the seat of an archbishop, and has still its university.

VALLADOLID, a t. of Mexico, in the state of Yucatan, 90 m. e.s.e. of Merida, stands in the midst of a highly cultivated tract of country. It is the best constructed and the healthiest town in Yucatan, and the seat of cotton manufactures. Pop. 15,000.

VALLAN'DIGHAM, CLEMENT LAIRD, 1820-71; b. Ohio, of Huguenot ancestry; spent a year at Jefferson college, Ohio; principal two years of an academy in Maryland; admitted to the bar, 1842; member of the legislature, 1845-46; editor of *Dayton Inquirer*, 1847-49; member of congress, 1857-63; bitterly assailed the measures of government for the suppression of the rebellion; was arrested by order of gen. Burnside; tried by court martial, and sentenced to close confinement during the war; but the sentence was commuted by president Lincoln to banishment beyond the lines of the army. He escaped to Canada, was nominated governor of Ohio by the democratic party, but was defeated by 100,000 votes; was a delegate to the Chicago convention, 1864. He died by the accidental discharge of a pistol in his own hand.

VALLARY CROWN (Lat. *corona vallaris* *Cx castrensis*), a crown bestowed by the ancient Romans as an honorary reward on the soldier who first surmounted the outworks, and broke into the enemy's camp. It is in form a circle of gold with palisades attached. The crown vallary occasionally occurs as a heraldic bearing.

VALLEJO, a city of California, 27 m. n.e. of San Francisco, on San Pablo bay, at the mouth of Napa creek; connected with Sacramento, 60 m. distant, by the California Pacific railroad, which terminates here; pop. 9,000. The harbor is spacious, and safe for the largest ships. It is built on the slopes of hills which rise 100 ft. above the bay. It contains 2 banks, 7 churches, a high school, a seminary for girls, a convent, an orphan's home, a grain elevator, 4 newspapers, gas and water-works, flouring-mills, ship-yards, factories for steam engines, sash, doors, and blinds. Large quantities of grain are exported.

VALLEY, a hollow tract on the earth's surface between hills or mountains. Valleys are generally parallel to the direction of the ridges of elevated ground; but some are transverse, cutting through the mountain-chain. They have a watercourse at or near their lowest level. The main valley is that which has the river of the drainage-system to which it belongs flowing through it, while the tributary streams which feed this river flow through lateral valleys. The terms upper and lower valley define parts of the same valley, as related to the source or to the mouth of the river which flows through it. In a narrow valley, the river always occupies the lowest part; but in wide valleys, especially in those in which waters run that are largely charged with sediment, the river often builds up a channel for itself, that is higher than the ground at the foot of the hill. The river, in its floods, bears a large amount of mud, which it continues to carry as long as the water is retained within its bed; but whenever it overflows its banks, the velocity is reduced, and the heavier particles, which form the bulk of the sediment, are deposited near the river's course; while, flowing over the surface of the level ground, even the particles fall to the bottom, until, as it reaches the limits of the valley, the water gradually becomes clearer. The Rhine, the Nile, and indeed almost all great rivers in wide valleys, illustrate this phenomenon. The river seldom flows through the middle of the valley, but is generally nearest to that side where the slope to the high ground is steepest; the opposite side of the main valley presenting a more gradual rise to the mountain summits, supplies the chief lateral valleys and feeding-streams to the river.

The origin of valleys has been a subject of considerable controversy, and this question continues to occupy the attention of geologists. At the time when a universal deluge was used to explain whatever was inexplicable in geology, it was considered to have been the agent which furrowed the earth's surface with valleys; and this opinion was entertained so lately, as to have been advocated by the late dean Buckland in his *Reliquiæ Diluvianæ*, until prof. Fleming showed the untenableness of these opinions.

At the present day, geologists are very much divided as to the origin of valleys. Some hold that they are the result of the operation of that internal agency which has, at different periods, so broken the crust of the earth, and changed its surface; while others maintain that various agents now operating more or less favorably in disintegrating and removing the solid materials of the exposed portion of the surface of the earth, produced the inequalities that now exist. There can be no doubt that all these have been active, and that the special advocacy of individual agents, as the sole producers of these phenomena, is the source of error, and the cause of controversy. Each and all have done their part; and in a satisfactory explanation, they must all be taken into account. That internal force has been a principal agent in producing the diversity of hill and valley, seems beyond doubt. This force acted by raising the surface perpendicularly from below upward; by producing great faults, which presented facilities for the action of running water; or by pushing a portion of the crust forward, so as to produce immense folds, alternating with mountain ranges. The Appalachians of North America, and the associated valleys, have been produced, as has been shown by prof. Rogers, by the last-mentioned method; and the tertiary strata of the Alps were carried up a 1000 ft., while the valley-beds of the Adriatic and the Mediterranean either remained

stationary or subsided to a lower level. The fact that some valleys are only the synclinal axes between the bounding mountain systems, like the basin of Switzerland between the elevated ridges of the Alps and the Jura, also confirms the opinion that some valleys owe their origin to the operations of an internal force, which operated in geologic ages in a more powerful manner than it has been known to do in historical times. In the face of such facts, it is surprising to hear practical geologists so influenced by pet theories as to assert that the action of internal force has "no direct effect on the external features of the ground." But this is the position of men who adhere to the strict Lyellian doctrine, that all the past changes on the earth's surface have been produced by agents now operating, and at the same rate, but through enormously protracted periods of time. But as these agents are various, so we have almost as many theories as there are agents. Lyell insists that ocean currents, and the wear and tear of the waves, have produced the inequalities. Jukes will have it that the atmosphere has disintegrated, and the rivers carried off the materials which formerly filled up the hollowed-out valley to a level with the surrounding hills; while Ramsay declares that glaciers were the important agents in the process. That any one of these alone has produced the great changes on the surface of the earth, is a position that would be maintained only by those who are blinded by their idol of a favorite hypothesis which they have to defend. But that all of them, in addition to the operation of an internal force, have been agents, more or less, in producing the present conformation of the earth's surface, cannot be doubted. While the advocates of superficial agents so completely ignore the influence of internal force, as in the statement of prof. Jukes quoted, those who maintain the opposite view are equally open to condemnation when they declare that "the wear and tear due to atmospheric sub-aërial erosive agency never could, even after operating for countless ages, have originated and deepened any of the valleys which occur in flat countries."—Murchison's address at British association, 1865.

VALLEY, a co. in central Nebraska, consisting of rolling prairies traversed by branches of the Platte river; 576 sq.m.; pop. '80, 2,324—2,035 of American birth. Co. seat, Ord.

VALLISNERIA, a genus of small, stemless, aquatic plants, with grass-like leaves, belonging to the natural order *hydrocharideæ*, and found in the warm parts of both hemispheres. They generally grow in running waters. *V. spiralis* is particularly celebrated on account of its peculiar process of fecundation. At the time when this is to take place, the flowers of the female plants rise to the surface of the water by means of their long spirally-twisted stalks. The flowers of the male plants, in order to follow them thither, become detached, having previously grown on short spikes at the bottom of the water, and expand, floating about upon the surface. After fecundation, the female flowers return under the water by the spiral contraction of their stalks, and the fruit is ripened under water. This plant is found in ditches and bogs in Italy and the s. of France.

VALLISNIERI, ANTONIO, 1661–1730; b. Modena; studied medicine under Malpighi at Bologna, and practiced in Reggio, 1688; appointed professor of medicine at Padua, 1700. He made great efforts to promote the knowledge of natural history; was noted for his researches into the different systems of generation, devoting much attention to the refutation of the doctrine of spontaneous generation. He was one of the first physicians to use Peruvian bark. His complete works were published at Venice in 3 vols.

VALLOMBROSA, a celebrated abbey of Tuscany, situated among the Apennines, in a valley surrounded with forests of fir, beech, and chestnut-trees (hence the name, meaning "shady valley"). Here an order of monks according to the rule of St. Benedict was founded about the middle of the 11th c., who were called Vallombrosians from the name of the site, or gray monks, from the color of their habit, which, however, was afterward changed to black. They were the first to admit lay brethren. The monastery became very wealthy through donations, and the present magnificent buildings were erected in 1637. It formed a refuge for priests during French rule in Italy. After 1815, the monks resumed possession, but in very diminished numbers. In 1863 the monastery was suppressed, and the buildings were made use of for a royal academy of forestry. The monastery and its highly picturesque environs are still much visited by artists and tourists.

Vallombrosa was visited by Dante, celebrated by Ariosto in the *Orlando Furioso*, canto xxii., and is mentioned by Milton in the *Paradise Lost*.

VALLS, an old-fashioned t. of Spain, in the province of Tarragona, in a plain watered by the Francoli, 55 m. w. of Barcelona. Valls is surrounded by ancient walls, has manufactures of cotton, woolen, silk, leather, and soap. The French, under St. Cyr, defeated the Spanish here in 1809; but were in their turn defeated in 1811. Pop. 12,655.

VALMORE, MARCELINE FÉLICITÉ JOSÈPHE DESBORDES; 1787–1859; b. Douai, daughter of M. Desbordes a poor artist; was educated in Guadalupe; appeared on the stage in France as a singer, and married the actor Valmore, 1817; left the stage and gave herself to literature. Her novels are *Recueil de poésies*, 3 vols.; *Le sveillées des Antilles*,

2 vols.; *L'atelier d'un Peintre*, 2 vols.; *Le salon de Lady Betty*, 2 vols. Her poems are *Elegies et Romances*; *Pleurs*; *Pauvres Fleurs*.

VALMY, a French village in the department of Marne, 20 m. n.e. from Chalons. In 1792, the Prussians, under the duke of Brunswick, after capturing Longwy and Verdun, were advancing toward Paris, driving the army of Dumouriez before them, when Kellermann (q.v.), who commanded the army of the Rhine, learning the critical situation of his comrade, hastened to his relief with 22,000 men, and taking up his position on the heights of Valmy, awaited the advance of the Prussians. These, possessing themselves of the heights of La Lune, immediately opened a vigorous cannonade on the French, to which the latter effectively replied. The explosion of two ammunition wagons within the French lines having thrown them into disorder, a body of Prussians, taking advantage of the confusion, advanced to the attack; but the energetic conduct of Kellermann, and the enthusiasm infused by him into his troops, restored their steadiness, and by a sudden charge with the bayonet, the Prussians were made to retire to their former position. This battle, or skirmish, frequently alluded to as the *cannonade of Valmy*, did not cost either army more than 800 men, but though, in a military point of view, an insignificant affair, it produced moral effects of the greatest importance. It was the first triumph of the republican arms, and with characteristic impulsiveness, the French were transferred from the depths of despair to the very pinnacle of self-confidence. When Napoleon was creating his "noblesse," this great service rendered to France by Kellermann was fitly remembered by his nomination as *duc de Valmy*.

VALOIS, HOUSE OF, a branch of the CAPETIAN dynasty (q.v.) which possessed the throne of France from 1327 till 1589, originated in the person of Charles, second son of king Philippe III. (*le hardi*), who obtained in 1285 the county of Valois in appanage from his father. Previously, the county of Valois had been possessed by a cadet branch of the great house of Vermandois; but on the union of the heiress of Vermandois with count Hugh the great, the younger son of king Henry I., and the failure of their descendants in the end of the 12th c., the Vermandois possessions, including Valois, were annexed to the French crown, till again separated in 1285, as above mentioned. But Philippe IV., the elder brother of Charles, having left three sons, who reigned in succession, and died without issue male, the succession fell, by the Salic law, to the eldest son of Charles, who accordingly ascended the throne as PHILIPPE VI. (q.v.). The elevation of the house of Valois to the throne of France gave rise to long and bloody wars with Edward III. of England, who claimed the crown through his mother, Isabel, the daughter of Philippe IV., insisting that the Salic law only prohibited the "succession" of females, and did not deny their capacity for transmitting a claim to the crown. But if Edward III.'s argument had been sound, it would have destroyed his rival's claim without benefiting himself, for the real heirs to the throne would have then been the Navarrese royal family, who were descended from the eldest daughter of Louis X. Edward, nevertheless, assumed the title of *king of France*, an example followed by all his successors till George III., and maintained his claims by force of arms till, by the mediation of the pope, a partition of the kingdom was effected. The French crown fell, by regular succession of son to father, to JOHN THE GOOD (1350-64), CHARLES V. (1364-80), CHARLES VI. (1380-1422), CHARLES VII. (1422-61), LOUIS XI. (1461-83), and CHARLES VIII. (1483-98), under the first four of whom the contest with England was carried on with spirit, at first to the advantage of the English, but latterly of the French, who, under Charles VII., succeeded in driving the English from all their strongholds, Calais alone excepted. Charles VIII. having died without leaving male issue the crown fell to the representative of the nearest collateral male line—that is, to Louis, son of Charles, duke of Orleans, and grandson of Louis, duke of Orleans, the younger brother of Charles VI., who ascended the throne as Louis XII. (1498-1515), the first of the Valois-Orleans régime; but he also dying without male issue, the succession devolved upon the descendants of his uncle, count Jean of Angoulême, whose grandson, FRANCIS I. (1515-47), next obtained the scepter, which he transmitted to his son, HENRY II. (1547-59). Henry's three sons, FRANCIS II. (1559-60), CHARLES IX. (1560-74), and HENRY III. (1574-89), occupied the throne in succession; but none of them leaving lawful male heirs, and all the collateral male lines proceeding from Philippe III. having become extinct, the crown passed to the house of Bourbon (q.v.), which was descended from his younger brother Robert.

The most distinguished cadet branches of the royal line of Valois were, the ducal family of Anjou, which long contested with the Aragonese royal family the possession of Naples; the last and most celebrated ducal house of Burgundy; and the illegitimate line of Dunois and Longueville, which was so productive of eminent warriors and daring politicians.

The Valois monarchs of the elder line were a succession of able rulers, who, by valor and policy, wrested France from the hands of the English, and firmly established the royal authority over their powerful, proud, and turbulent nobility; those of the younger, or *Valois-Orleans* and *Valois-Orleans-Angoulême* lines were, with the single exception of Francis I., a series of weak princes, under whose feeble rule the country was distracted by contests for power between rival nobles, and religious dissensions among the people at large, though, owing to the number of able men on whom devolved the cares of

government, the country suffered less from the incapacity of its monarchs than might have been expected.

VALONIA, an article very extensively used by tanners, in consequence of the quantity of tannic acid which it contains. It is the acorn-cup of a species of oak (*quercus agrifolia*), indigenous to Asiatic Turkey. It is very largely imported into Great Britain from Smyrna and the Greek isles; as much as 40,000 tons have been received in one year. In 1877, the imports were 29,989 tons; value £668,497.

VALPARAISO, a province of Chili, bounded e. and s. by Santiago, w. by the Pacific ocean; pop. 178,523; sq. m. 1584. Surface mountainous, soil in the valleys fertile, producing good crops of cereals, grasses, and fruits. Agriculture is the principal industry. Wine and brandy are made. Mines of silver and copper are worked. The province is divided into the departments of Valparaiso, Quillota, Limache, and Casablanca. The islands of Juan Fernandez belong to this province.

VALPARAISO, the most important trading-town of Chili, South America, is situated in the province and on the bay of the same name, about 90 m. w.n.w. of Santiago (q.v.), with which it is connected by railway. It is chiefly built on a narrow strip of land, at the head of the bay. It contains theaters, colleges, hospitals, and a number of scientific and literary institutions; its streets, though narrow, are well paved; and its houses, almost all two stories high, are gaily painted, and furnished with balconies. The picturesque bay of Valparaiso, which is generally crowded with ships, is sheltered from all quarters except the north; and in the winter months, when northern gales prevail, the anchorage is considered dangerous. In 1822, the town was nearly destroyed by an earthquake; and on several occasions since that time, its progress has been checked by the same cause: in spite of this, however, Valparaiso has made great progress within recent years, its population having increased from under 10,000 in 1825, to 97,575 in 1875. Fifteen forts, mostly new, defend the bay. Nearly 3,000 vessels, of about 700,000 tons, enter and clear the port annually; the imports, which value about 17,000,000 dollars, being chiefly cotton, silk, and woolen goods, hardware, iron, sugar, wines, spirits, tobacco, etc.; and the exports, which value 9,000,000 dollars, being chiefly copper and copper ore, silver, gold, wheat, flour, tallow, hides, and wool. Valparaiso was bombarded by the Spanish fleet Mar. 31, 1866. Few lives were lost, but buildings and other property, the value of which was estimated at from 9,000,000 to 20,000,000 dollars, were destroyed.

VALPY, RICHARD, D.D., 1754-1826; b. island of Jersey; educated at the college of Valognes, Normandy, 1764-69, graduated at Oxford, 1776; ordained in the church of England; settled at Bury St. Edmund's; rector of Stradishall, Suffolk, 1787; head master of the school at Reading, founded by Henry VII. He was a successful teacher, and prepared for the school Latin and Greek grammars and text-books which have been much used. His youngest son, the rev. Frederick E. J. Valpy, who graduated at Cambridge, succeeded him in the school. He published *Etymological Dictionary of the Latin Language*; *Etymology of Words of the Greek Language in Alphabetical order*.

VALTELLINA, a valley of Lombardy, province of Sondrio, bounded n. by the Swiss canton of Grisons, n.e. by Tyrol, s. by the province of Brescia, Bergamo, and Como, w. by lake Como and the valley of Chiavenna. It is 45 m. long. It now forms the Italian province of Sondrio. It is very fertile, producing wine, grain, fruit, and cheese. This and the two valleys of Bormio and Chiavenna belonged to the dukes of Milan in the middle ages; became part of Grisons, 1512, and continued in possession of the Swiss, successfully resisting the efforts of Austria through the 30 years' war to get it; became part of the French department of Adda in 1804; came under Austria, 1814, as a part of Sondrio; and in 1859 became subject to Italy. The chief towns are Sondrio (the capital), Teglio, Tiramo, Chiavenna, Bormio, Grossotto.

VALUATIONS OF LAND have been found necessary in order both to regulate liability to taxation, and in feudal times to determine the amount of casualties or occasional profits due by the vassal to the superior. Domesday book (q.v.) contains the earliest valuation of the lands of England. Valuations were made in succeeding times, when the raising of imposts by subsidies became common, these imposts being apportioned on the people of the realm in respect of their reputed estates. Land was the chief subject of taxation, and was assessed nominally at the rate of 4s. per pound. But while land was rapidly increasing in value, the practice grew up of adopting an old valuation, by adhering to which the nominal 4s. rate came in course of time to amount to less than 2d. per pound. In 1692 it was resolved that a new valuation, correspondent to the existing state of the land, should be made, and a tax levied on all land throughout the realm of 1s. per pound, which in time of war was afterward raised to 4s. This impost, called the land tax, was made permanent by 38 Geo. III. c. 60, which act also provided the means of enabling it to be redeemed. Though once the most productive of all the resources of the state, the land tax now furnishes a very small fraction of the revenue, and so far as not redeemed, it is still collected on the basis of the valuation of 1692, which has long ceased to be an approximate estimate of the value of land. In the collection of the income tax, the actual value, as annually fixed by commissioners and assessors, is adopted as the criterion.

In Scotland the contributions levied in the 13th c. seem to have been made with reference to the value of the lands as ascertained, either by some general valuation, or by separate valuations in individual returns. The value as at that period was afterward known as the *old extent*, or old valuation. In the beginning of the 14th c. land diminished greatly in value in those parts of the country that had been subjected to the ravages of the war; and the Scottish parliament, in granting a subsidy to Robert I. of a tenth penny of all the rents of the laity, provided that those lands which had been wasted by the war should be revalued, and that the returns should state both the present value and the former value in time of peace. But in the course of time, as prosperity returned to Scotland, the revaluation, or *new extent*, as it was called, came to be above instead of below the old value; and it became the practice to estimate the new extent by adding a certain proportion of the old valuation, to compensate for the advanced improvement in the country, and the change in the value of money. Under Cromwell, and after the restoration, in Scotland as well as in England, the mode of taxation adopted was first to name the sum to be raised, and then to distribute it among the counties; and an act of convention of 1637 directed that in apportioning the taxation of each county on the individual landholders, it should be in the power of the commissioners to rectify the old valuations when necessary. The rent established by these valuations is known as the *valued rent*, and continued till 1854 to be adopted for the land tax, and most of the other public and parochial assessments. By a statute of that year (17 and 18 Vict. c. 91), the commissioners of supply of every county, and the magistrates of every burgh, are directed to cause a valuation roll to be made up annually, showing the rent or value of the whole lands and heritages within the county or burgh, by which roll all local assessments are in future to be regulated; and provision is made for the appointment of assessors to carry out the act. By 20 and 21 Vict. c. 53, commissioners of supply and burgh magistrates are further empowered to appoint the officers of inland revenue belonging to the county or burgh as assessors; and failing their doing so, the valuations made are not to be conclusive against assessments. The new system of valuation established by these acts is perhaps the most perfect in the world; it possesses the merit of giving universal satisfaction, and is noted for its simplicity.

VALUE, in political economy, is one of those terms which demand attention more for the clearing away of its application to vague and fallacious uses, than for an attempt to give it strict scientific definitions. It has a distinct meaning only when it is used as "value in exchange," and that between things co-existing in time and place. The measure of such value is the current money of the place. So two articles, each of which will bring £5 in London, are equivalent in value there. Cost has nothing to do with value. If a bale of silk has cost £100, and from disease in the silk-worm, the price of the commodity rises, so that it will bring £150, that is its value. So also if there be a fall, so that it will only bring £75, that is its value. Vain endeavors have been made to establish a permanent standard of value for the purposes of comparing with each other the conditions of people living at long intervals. The changes which affect one thing affect all others; so that comparisons resolve themselves into the nature of fluxions. Money, so effective in estimating contemporary values, is quite useless here. Some years ago grain, as the necessary of life, was used as a standard of value. It may be an approximate standard, while a people are so poor as to possess little more than the necessities of life; but when a country becomes so rich that these are but a proportion of the wealth to be estimated, their capacity as a standard is gone.

VAMBERY, ARMINIUS, traveler and philologist, was b. in Hungary in 1832. He was compelled to leave his country after the revolution of 1848, and went to Constantinople, where he devoted himself to studying Oriental languages. In 1861 to 1864 he traveled, in the disguise of a dervish, by routes unknown to Europeans, through the deserts of the Oxus to Khiva, and thence by Bokhara to Samarcand. His position precluded him from making instrumental observations for the purposes of geography, but was eminently favorable to an insight into the customs and language of the peoples visited. On this account, therefore, his *Travels and Adventures in Central Asia*, published at London in 1864, is a very valuable work. His other publications are *Wanderings and Adventures in Persia* (1867); *Sketches of Central Asia* (1868); *History of Bokhara* (1873); and *Central Asia and the Anglo-Russian Question* (1874). Vambery is now professor of Oriental languages at the university of Pesh.

VAM BRACED, in heraldry (Fr. *avant-bras*, fore-arm), a term applied to an arm clothed in armor, a dexter arm embowed vambraced proper, the gauntlet holding a sword below the hilt in bend sinister, point downward, argent, hilt and pommel or.

VAMPIRE (Ger. *vampyr*), called also by the Servians *rukodlak*, and by the Wallachians *murony*, is, according to the popular belief of the Slavonic, Romanic, and Greek population of the Lower Danube and the Thessalian peninsula, a blood-sucking ghost. In the mythology of the ancient Greeks, beings of a similar nature existed—the Lamas, beautiful phantom women who, by all sorts of voluptuous delusions, allured youths to them in order to feast on their fresh, young, and pure blood and flesh. And among the Greek Christians there is a belief that the bodies of those who have died in excommunication are kept by the devil in a kind of life: that they go forth from their graves by night and suddenly destroy other men, and also by other means procure food, and thus

keep themselves in good condition. They are called *Burkolakkä*, or *Tympanitä*; and the only way of escaping from their molestation is by digging up their unwashed corpses and burning them, after the removal of the excommunication. The vampire proper is the illegitimate offspring of parents themselves illegitimate, or the troubled spirit of one killed by a vampire. During the day he lies as a corpse, but turned in his grave, with a florid appearance and warm blood, open staring eyes, and skin, hair, and nails still growing. But by night, especially at full moon, he wanders about in the form of a dog, frog, toad, cat, flea, louse, bug, spider, etc., and sucks the blood from living persons by biting them in the back or neck. If a dead person is under suspicion of being a vampire his body is disinterred, and if it is found putrid it is only sprinkled with holy water by the priest; but if it is red and bloody, the devil is driven out, and on re-interring it a stake is driven through the breast, or a nail through the forehead; or it is perhaps burned. The *Vukodlaks*, who are particularly greedy for the blood of young girls, pair with the *Wjeschitzä*, a female ghost with wings of fire, which by night sinks down on the breast of the sleeping soldier, presses him in her arms, and inspires him with her fury. As, according to popular belief, every one who is killed by a vampire becomes himself a vampire, an outward sign of the vampire bite usually remains, although not always visible and recognizable by every one; therefore, at the obsequies of every *Wallachian*, of whatever age or sex, there is always a skilled person, generally a midwife, called in, in order to take precautions against the corpse becoming a vampire. A long nail, for instance, is driven through the skull; it is then rubbed in various places with the lard of a pig killed on St. Ignatius's day, and a stick made of the stem of a wild rose is laid beside it. *Thessaly*, *Epirus*, and the *Wallachians* of the *Pindus* know another kind of vampire still—living men who by night leave their shepherd dwellings, and, roving about, bite and tear everything that they meet, men as well as beasts. The *Priccolitsch* and the *Priccolitschone* of the *Moldavo-Wallachians*, who wanders about more frequently than the *Murony* proper, is likewise a real living man, who, by night, in the form of a dog, roams over heaths, pastures, and villages; and especially kills cattle and sucks their blood, from which cause he always looks healthy and blooming. Such a man is known by his backbone being prolonged in the form of a dog's tail. Thus the *Vukodlak* and the *Murony* may be something analogous to the nightmare of German mythology; and the *Priccolitsch*, on the other hand, to the *Werwolf* (q.v.). The *ghouls* of the *Arabs* and *Persians* would seem to be identical with the vampires. In 1725 and 1732 exciting rumors about supposed vampires arose in Hungary and Servia, which resulted in the disinterment of numerous corpses and caused the publication of a multitude of writings in Germany for and against the matter, among which the most important is *Ranft's Treatise on the True Nature of the Hungarian Vampire*, in which an account is given of all the writings which had appeared on the subject (Leip. 1734).

The name vampire has been appropriated to blood-sucking bats. It was erroneously given to bats of the s.e. of Asia and Malayan archipelago, which are really frugivorous. The blood-sucking bats are all South American, and belong to the genus *phyllostoma*, or specter-bat (q.v.), and genera nearly allied to it. The true vampires (*desmodus*) resemble the specter-bats; they have a small bilid membrane on the nose, no tail, and the interfemoral membrane little developed. They have two great projecting, approximate upper incisors, and similar lancet-shaped superior canines, all of which are very sharp-pointed, and arranged to make a triple puncture like that of a leech. There are four bilobiate inferior incisors, the innermost separated by a wide interval; the lower canines are small; there are no true molars, but two false molars in the upper jaw, and three in the lower, of a peculiar form, apparently unfitted for mastication. The intestine is shorter than in any other mammal, and the whole structure seems to indicate that blood is the sole food. In some parts of South America, vampires are very numerous, and domestic animals suffer greatly from their nocturnal attacks. They seem to take advantage of an existing wound, but they can also make one. In some parts of Brazil the rearing of calves is impossible, on account of these bats, and there are districts, chiefly those in which limestone rocks prevail, with numerous caves, in which cattle cannot be profitably kept. Vampires sometimes attack men, when sleeping in the open air; but the stories of their fanning their victims with their wings, whilst they suck their blood, are fabulous.

VAN, a fortified town of Turkey in Asia, capital of a district of the same name, stands near the s.e. shore of lake Van, 145 m. s.e. of Erzeroom. It is overlooked by a citadel, now much dilapidated, put which, from its position on a lofty height, might be of importance, and in good repair, and well defended, would be also almost impregnable. Cotton goods are manufactured, and the bazaars are well stored with the produce raised in the vicinity. The streets are narrow, dirty, and ill-paved, but most of the houses are well-built. The principal public buildings, in addition to the citadel, are the mosques, the Armenian churches, the baths, the caravansaries, and the bazaars. Van is always called among the Armenians *Schamiramakert*—i.e., town of Semiramis—contains ancient ruins, and cuneal inscriptions are found in which the name *Xerxes* frequently occurs. Pop. stated at 45,000.—The district of VAN, a territory of Turkish Armenia, has sometimes been a separate pashalik, and sometimes a subordinate division. It is bounded on the e. by Persia, and on the n. by the lately acquired Russian possessions in Armenia. It consists mainly of a lofty basin, surrounded by steep mountains, in the

center of which is the lake of Van. The climate is very hot in the lowlands. The productions are corn, fruit, wine, flax, tobacco, cotton, timber, manna, gall-nuts, and honey. The pasturage being exceedingly good, great numbers of live-stock are reared, and, with the other agricultural products, form the chief exports.—The LAKE OF VAN is a considerable inland sea, 80 m. long and 50 m. in extreme breadth, though the average breadth is not nearly so great. Area, 1200 sq. miles. It is fed by about eight streams, and has no visible outlet. Its waters are salt, and the only fish caught in it are a kind of sardines, which are salted and exported throughout Asia Minor.

VAN, a species of carriage for merchandise, sometimes covered, and in use for carrying household furniture; in other cases, open and of a lighter nature, used by shopkeepers for sending articles to their customers. Whether large or small, or with four or only two wheels, the van is set on springs, and it might be called a spring-cart or wagon. The term van seems to be an abbreviation of caravan, which was formerly in use.

VANA DIUM (symb. V, equiv. 51.3), a rare metal of little practical importance. The name was first given to a substance then believed to be an elementary metal, but which has since proved to be a compound. The discovery of the substance was ascribed by some to Del Rio in 1801, and by others to Sefström in 1830. The last-named chemist found it in a Swedish iron ore, and gave it the name of vanadium, from *Vanadis*, a cognomen of the Scandinavian goddess Freyja. Roscoe has, however, demonstrated that this substance is really a compound of oxygen with a metal, and to this new metal the symbol V is now appropriated. In the light of Roscoe's discovery, the V of the old formula becomes V_2O_3 , and the oxides VO, VO_2 , and VO_3 , become V_2O_3 , V_2O_4 , and V_2O_5 . In very small quantities, vanadium is present in nearly all clays, but its most abundant source is vanadate of lead, which has been found in Mexico, Chili, and at Wanlockhead in Scotland.

VANBURGH, Sir JOHN, an eminent architect and dramatist of the 18th c., was the grandson of a Protestant refugee of Glent, who settled in England during the reign of queen Elizabeth. Vanburgh is supposed to have been born in Chester (in which city his father was a merchant), in the year 1666, and to have been sent to France for his education. His artistic studies were interrupted for some time by his entering the French army, which, however, he left after attaining the rank of capt. On returning to England he must soon have acquired reputation as an architect; for, in 1695, he was made one of the commissioners for finishing the palace of Greenwich for the purposes of an hospital. His first attempt at play-writing was *The Relapse*. It was brought out at Drury Lane with such success, and obtained such popularity, that Vanburgh ranked ever after as one of the leading wits and dramatists of his day. About 1697 he wrote his famous comedy, *The Provoked Wife*, for Lincoln's Inn theater, where it was produced with even greater success than that which had attended *The Relapse*. He then, in partnership with Congreve, started a theater in the Haymarket, and there brought out his play, *The Confederacy*. But so ill-suited was this building for speaking in, that not even the brilliant wit and racy humor of the *The Confederacy* could command an audience, and Congreve abandoning the scheme, the theater had to be closed. In 1702 he erected for the earl of Carlisle the noble palace of castle Howard, in Yorkshire; and this led to his being employed as the architect of many mansions for the noble and the wealthy in other parts of the country. His reputation was now such that he was commissioned to erect Blenheim house, which the parliament had voted to the duke of Marlborough; but as no particular fund had been provided for meeting the expenses, and as parliament refused, when applied to, to grant any money for that purpose, the commission was more honorable than lucrative. The queen supplied from her own private purse most of the funds; but after her death this supply was of course stopped. The duke of Marlborough having also died, left a specific fund to be expended in meeting the architect's claims; but the duchess not only refused to pay Vanburgh his salary, but dismissed him from his office; and the house was completed under some other management, but from the original designs. After a great deal of trouble, Vanburgh managed to get nearly all the money that was due to him; but ever after was the sworn foe of the duchess of Marlborough. In 1714 he was made comptroller of royal works. Vanburgh died at Whitehall on March 20, 1726, leaving his well-known and popular drama, *The Provoked Husband*, unfinished. His plays can hardly be said to be popular now, their licentious tone and loose morality preventing their being read to that extent to which the brilliancy of their wit, keenness of their satire, and genuine character of their humor would otherwise entitle them. They want the polish of Congreve's dramas, yet, at the same time, they are not infected with the artificiality, stiffness, and labored brilliancy which disfigures so many of Congreve's best scenes. The interest is well sustained throughout, the characters—such as they are—are real, natural, and racy; the situations striking, and the dialogue brilliant and unflagging. The best edition of them is contained in Leigh Hunt's *Comic Dramatists*, to which is also prefixed an excellent life of Vanburgh. His architectural works are still among the first of their kind—massive, picturesque, varied in outline, and wonderfully skillful in composition, though a frequent carelessness in the management of details spoils some of his best effects.

VAN BUREN, a co. in n. Arkansas, containing ledges of millstone grit; 1150 sq. m.; pop. '80, 9,565-9,540 of American birth, 116 colored. Co. seat, Clinton.

VAN BUREN, a co. in s.e. Iowa; 500 sq. m.; pop. '80, 17,042-16,267 of American birth, 120 colored. Co. seat, Keosauqua.

VAN BUREN, a co. in s.w. Michigan, having lake Michigan for its w. boundary; 630 sq. m.; pop. '80, 30,808-23,414 of American birth, 824 colored. Co. seat, Paw Paw.

VAN BUREN, a co. in e. Tennessee; 211 sq. m.; pop. '80, 2,933-2,929 of American birth, 185 colored. Co. seat, Spencer.

VAN BUREN, JOHN, 1810-66; b. N. Y.; educated at Yale college, where he graduated in 1828; and having undertaken the study of law, was admitted to practice at the bar in New York in 1830. His father, afterward president, having been appointed, but not confirmed, minister to England, in 1832, he accompanied him as an *attaché* during his brief stay in that country. Returning, he resumed practice, and in 1845 was appointed attorney-general of the state, an office which he held three years. The remainder of his life was spent in his professional business, in which he gained success and reputation. He was genial and agreeable by nature, a wit, and a *bon-vivant*; and became noted for popular oratory, particularly for after-dinner speeches. In the spring of 1866 he made a tour of Europe, and died Oct. 13, at sea, on his return voyage.

VAN BUREN, MARTIN (BUREN, VAN, *ante*), 1782-1862; b. N. Y.; a lawyer and politician before he had come of age. In 1812 he was in the state senate; three years later was attorney-general; and after being again state senator, was chosen U. S. senator in 1821. He was re-elected in 1827, but resigned to accept the office of governor of the state. He was elected vice-president in 1832 on the ticket with Andrew Jackson, and was elected president at the close of Jackson's eight years' administration in 1837. His administration was rendered notable by his financial views during the panic which occurred in its first year, and which eventually resulted in the passage of a law establishing the independent treasury system. The influence of the slavery question in politics became virulent at this time, and it was even proposed by a member of the South Carolina delegation in the house of representatives that that state should secede from the union. Mr. Van Buren was defeated for a second term in 1840 by the whig candidate William H. Harrison. In 1844 his name was proposed for nomination, but Mr. Polk was nominated and elected. In 1848 he accepted the nomination of the free-soil party, and his candidacy occasioned the election of gen. Taylor. He now retired from public life; made a tour in Europe, 1853-55; and died at his birth-place, Kinderhook, Columbia co., N. Y., July 24, 1862. A posthumous work by him was published in 1867, entitled *An Inquiry into the Origin and Course of Political Parties in the United States*.

VANCE, ZEBULON B., b. N. C., 1830; spent a year at the university of N. C., admitted to the bar, 1853; member of the legislature, 1854-58; member of congress, 1858; re-elected, 1859; governor of the state at its secession, 1861, which at first he opposed; though he afterward was active in the rebellion; was elected to the U. S. senate, 1870; re-elected governor, 1876; and re-elected to the U. S. senate, 1879.

VAN CORTLANDT, PHILIP, 1749-1831; b. N. Y.; was a land-surveyor at the age of nineteen; joined the patriot army as lieutenant, at the beginning of the revolutionary war; was appointed col. of 2d N. Y. regiment, 1776; served at the battle of Stillwater and against the frontier Indians, 1778; commanded a regiment of militia under Lafayette, 1780; made brig. gen. for gallantry at Yorktown; was a member of the legislature, 1788-90; of the state convention which adopted the U. S. constitution, 1788; state senator, 1791-94; member of congress, 1793-1809. In 1824 he accompanied Lafayette in his tour through the United States.

VANCOUVER, GEORGE, 1758-98; b. near London; entered the navy, 1771; midshipman with capt. Cook in his voyages, 1772-75 and 1776-80; made first lieutenant, 1780; served several years in the West Indies, and returned to England, 1789. A quarrel having arisen between some Englishmen who had settled in Nootka and the Spanish officers who were making a survey of the n.w. coast of America, Vancouver was sent to demand the surrender of Nootka from the Spanish commander. Having obtained the surrender he spent the summers of 1792-94 in surveying the coast as far as Cook's inlet, and the winters in the Sandwich islands. Returning he surveyed part of the w. coast of South America from the island of Chiloe, and arrived in England Oct., 1795. The account of his expedition which was nearly completed at the time of his death, was published in London (1798) in 3 vols. 4to.

VANCOUVER ISLAND, now, jointly with British Columbia, one of the colonies of Great Britain, forms a part of the Dominion of Canada, and is bounded on the w. by the Pacific, and on the e. by Queen Charlotte sound, Johnstone strait, Discovery strait, and strait of Georgia, which, taken together, form an open sea-way, separating the island from British Columbia. Lat. 48° 20' to 51° n., long. 123° to 128° west. It is 270 m. in length, from 30 to 50 m. in average breadth, and is of importance not only for its great natural resources, but also from its geographical position, which gives it, both commercially and in a military point of view, the command of the Pacific. Area, about

16,000 sq. miles. The main mass of the island is a mountain ridge, which rises in its highest peak, mount Arrowsmith, to the height of 5,500 ft., and whose buttress-like walls descend for the most part abruptly to the shore. There are, however, in many coast-districts, especially on the s.e. and e. sides, undulating tracts, thickly wooded in general, but here and there containing patches of open grass-land. The outline of the island is boldly picturesque. The shores are marked by abrupt rocky cliffs and promontories, by pebbly beaches and sheltered coves, with fine harbors. The w. shores are gloomy and frowning in aspect, deeply indented by fiord-like arms of the sea, the banks of which are formed by steep rocks, rising like walls. The surface is diversified by mountain, precipice, hill, dale, and lake, and the whole country is more or less densely wooded, except where the mountain summits afford no foot-hold for plants, or where open grass-lands occur. There are no navigable rivers, and the streams, which are torrents in winter, and are nearly dry in summer, are short, and are valuable only as supplying power for grist and saw mills. Springs are numerous, and the water excellent. The climate closely resembles that of Great Britain, subject, however, to modifications traceable to the position of the island. The ocean that washes its shores is throughout the whole year of a remarkably low temperature, owing to the arctic currents that sweep down along the coast, even to the lat. of San Francisco; and westerly winds blowing over the chilled sea-water, modify the climate of the island considerably. Again, winds from the s.e., from the snow-covered Olympian mountains in Washington territory, are also cold. Owing to these causes, the climate of the island, even so far on as the middle of June, resembles a late English spring—having a clear atmosphere, bright sun, and cold winds. The winter, as a rule, is open and wet; the spring is later and colder than in England, and the summer drier and hotter. The maximum temperature is about 84° Fahr., and the minimum about 22° Fahr. Only a small proportion of the surface is suited for agriculture, four-fifths being little better than barren rock. The crops generally raised are wheat, barley, oats, and peas. The green crops are turnips, mangold-wurzel, vetches, potatoes—which flourish here in unsurpassed excellence—and all sorts of vegetables. Of wheat, the average production is 25 to 30 bushels per acre; of oats, 40 bushels; barley, 40 bushels. Fruit-culture is a very profitable branch of industry. Gold has been found; coal is very abundant; and copper, silver, lead, and other ores abound. The puma, the bear, and wolf still range in the forests; two kinds of deer are found; there are two kinds of grouse; and snipe and wild-fowl in great variety. Salmon abound. Extensive banks lie about 32 m. off the s.w. shore. All of them are well-stocked with fish, especially the cod, herring, haddock, whiting, halibut, and sturgeon. A company has been formed to prosecute the fisheries; and there is an extensive market along the w. coast of America. Among the valuable woods of the island, the white fir, or Douglas pine, one of the best woods for spars known, is at once the commonest and most important. In some instances, this tree has been known "to square" 45 in. *for* 90 feet. The cedars have an average diameter of 6 to 7 ft., and one has been measured 14 ft. in diameter. Ship-building has sprung up, and is an important branch of industry. The capital of the island is Victoria (q.v.). The pop. (including Victoria) is 6,000; together with a large floating pop. of miners, and about 18,000 natives, who, however, are gradually disappearing.

The island was discovered in 1762 by capt. Vancouver, an officer in the British navy. Its possession was secured to Britain by treaty in 1846; previous to 1858, it was held, together with British Columbia, by the Hudson's Bay company under lease from the crown; later, it was for two years an independent colony; but in 1865, Vancouver island and British Columbia were united. See COLUMBIA, BRITISH. The Canadian Pacific railway is to fix its ultimate terminus on Vancouver island, which will thus stand in unbroken communication with the Atlantic coast.

VAN CURLER, ARENDT, b. Holland; cousin of the patroon Van Renssalaer of Renssalaerwyck; became superintendent of the region around what is now Albany as early as 1642. Under governor Stuyvesant he began and carried out that policy of peace and justice to the Indians by which the people of New Netherlands and New York enjoyed immunity from hostilities and the friendship of the Indians south of Canada until the revolutionary war divided even friends of the same household. New York and Pennsylvania were the only two colonies of which this could be said. In 1642 Van Curler rode into the Mohawk country to rescue three French prisoners from their captors. This was the first of many successful efforts by which Europeans were saved from death by torture. He learned the Mohawk tongue, sat at their council fires, smoked the calumet with them, and, for the English governors, carried out the same policy of amity. In 1661 he bought the "Great Flat" of the Mohawk river from the Indians, led a band of settlers from Albany, and founded Schenectady in 1662, the first agricultural settlement in the province, in which farmers could hold land in fee-simple, free from feudal annoyances, such as paying rent to a patroon or local official. So great was his reputation among the Indians that for many years, even after his death, they always addressed the Dutch and English governors as "Corlear." By the French, the town which he founded was also called "Corlear." In 1667, being invited to visit the French governor of Canada, he, while on his way to Quebec, was drowned off Split Rock in lake Champlain. The "baye Corlear," as Peru bay in Essex co., N. Y., by the

French, and "Corlear's lake," as lake Champlain, by the English, were long called, and "Corlear's Hook," near Manhattan island, keep alive his name and memory.

VANDA, a genus of plants of the natural order *orchidææ*. *V. corulea*, one of the most beautiful of Indian orchids, is highly prized by cultivators in Britain, and plants are sold at prices of £3 and upward. It has panicles of azure flowers. Dr. Hooker found it on the Khasia mountains, growing in great confusion, epiphytically upon the oak, banyan, etc.

VANDA'LIA, capital of Fayette co., Ill., on the Kaskaskia river; at the junction of the Illinois Central, and the St. Louis, Vandalia and Terra Haute railroads; 30 m. w. of Centralia, 68 m. n.e. of St. Louis; pop. '75, 2,100; was the capital of the state until 1836. It contains a court-house, 6 churches, 2 national banks, 2 newspapers, and various manufactories.

VANDALS (Lat. *Vandālī*, also *Vindīlī* and *Vandulī*), a famous race of European barbarians, probably of Germanic, though some consider them of Slavonic origin. Procopius, who agrees with Pliny in considering them one with the Goths, states that they originally occupied the country about the *Palus Mæotis* (sea of Azov), but it would appear that afterward they migrated to the n.w., and settled s. of the Baltic, between the rivers Vistula and Viadus (Oder). They make their first appearance, however, as a historic people in the 2d c. A.D., at which time they inhabited the north-eastern slopes of the Riesengebirge (called after them, *Vandalici montes*), and figure as the associates of the Marcomanni and Quadi in the plundering expeditions into Pannonia, and the wars with Marcus Aurelius. In the latter half of the 3d c., they are found in the Roman province of Dacia, along with Goths and Gepidæ. According to Jornandes, the Gothic king, Geberic, annihilated a large part of the nation on the banks of the Maros. The remainder were transplanted by Constantine to Pannonia, where they lived in peace for 60 years. But at the beginning of the 5th c., urged, it is said by Stilicho, they abandoned their new homes, and in company with the Suevi, Alani, and other German tribes, led by their king, Godegisil, burst into Gaul, which they miserably wasted for the space of three years. Thence they swept through the passes of the Pyrenees into Spain, which experienced a similar fate; and finally, after much quarrelling and fighting with their German associates, they settled in a part of Bætica, which received from them the name of *Vandachia* (mod. *Andalusia*). In 429, at the call of Bonifacius, governor of Africa, who, from being the most reliable bulwark which the western empire possessed, had been driven into rebellion by the false representations of Aëtius (see VALENTINIANUS III.), they crossed the strait of Gibraltar, under their leader, Genserich (q.v.), in one restless horde (numbering 50,000 to 80,000 in all), carrying devastation and ruin from the shores of the Atlantic to the frontiers of Cyrene. They were joined by the Donatists (q.v.), a sect of African heretics, and being themselves Arians, they inflicted great cruelties upon the orthodox Christians. Meantime Boniface had discovered the treachery of his rival Aëtius, and set himself, when too late, to remedy the dreadful consequences of his too credulous resentment. He advanced with a small and hastily-levied force, but was defeated with considerable loss, and driven into Hippo (now *Bona*), which he defended for more than 14 months. During the siege St. Augustine died—Aug. 28, 430. Boniface, reinforced by a Byzantine army under Aspar, now sallied out upon the Vandals, and a second defeat decided the fate of Africa. In 439 Genserich broke the peace which he had concluded with Valentinian III., in 435, and conquered Carthage. A new peace was established which recognized the authority of the Vandals over n. Africa from the Atlantic to Cyrene, over the Balearic isles, Sardinia, Corsica, and part of Sicily. In 455 the Vandals invaded Italy, and plundered Rome for 14 days. The manner in which they mutilated and destroyed the works of art collected in the city, has originated the application of the term *Vandalism* to all similar barbarism. After the death of Genserich (477), his son, Hunneric, cruelly persecuted the Catholics; warred against the Moorish races in n. Africa, who were trying to recover their independence, and kept the Mediterranean in a state of alarm by his piracies. His successors, Guntamund (d. 496) and Thrasamund (d. 523), were comparatively mild and tolerant rulers; the latter was even friendly to literature. But the warm climate, and the love of luxurious pleasure, now began to enervate the spirit of the Vandals; and the natives in different parts of Africa, showed unmistakably that they had ceased to fear them. Thrasamund was compelled to solicit aid from his brother-in-law, Theodoric (q.v.), who sent him a Gothic contingent to help him against the Moors of Tripoli. After his death, Hilderic, a son of Hunneric, became ruler, but he showed such strong leanings toward Catholicism (owing to his long residence in Constantinople), that his subjects grew discontented, and he was overthrown by his uncle, Gelimer, in 530. This led to the emperor Justinian sending an expedition, under Belisarius, against Gelimer in 533. When the latter heard of the arrival of the great Byzantine general, he caused Hilderic and his sons to be put to death, but was himself soon after forced to seek refuge in the wilds of Numidia. In 534 he surrendered, was carried to Constantinople in triumph, and ended his life in Asia Minor. Most of the Vandals were drafted into the imperial army, and "used up" in the wars with Persia. The few who remained in Africa rapidly disappeared among

the natives.—See the various histories of the Roman empire; also Papencordt, *Geschichte der Vandal; Herrschaft in Afrika* (Berl. 1837).

VANDAMME, DOMINIQUE JOSEPH, Count, 1770-1830; b. Cassel, department of Nord; enlisted at Martinique, 1788; returning to France at the beginning of the revolution, became at the age of 22 a brig gen. in the army of the north. Having served under Jourdan in the campaign of 1795, he was transferred to the army of the Rhine, and distinguished himself in all the wars of the empire, but in the Russian expedition took no part on account of a quarrel with Jerome Bonaparte, king of Westphalia. In 1813 he was forced to surrender with 10,000 troops to the enemy; was confined for some time in Russia; returned to France, 1814; went to the United States, 1816; returned to Cassel in 1824.

VANDENHOFF, GEORGE, b. England, 1820; made his debut on the stage at Covent Garden, London, 1837; appeared at the Park theater, New York, 1842; left the stage, 1856; admitted to the bar, 1858; and has latterly given public readings. He published *Pain System of Elocution; Leaves from an Actor's Note-Book; Dramatic Reminiscences; Clerical Assistant; A Lady's Reader, with Rules for Reading Aloud*.

VANDERBILT, CORNELIUS, 1794-1877; b. N. Y.; of Dutch ancestry. He received but little education, and while a boy earned a living by carrying passengers and produce in a small boat (periauger) between New York and Staten Island, where he lived. The war of 1812 gave him an opportunity of enlarging his business by supplying the government posts with provisions; and he saved sufficient money to purchase a schooner and engage in the coasting trade. In 1817 he ran a steamboat from New York to New Brunswick, N. J., in connection with the passenger traffic with Philadelphia; and under his able management a line of steamboats was the result of this enterprise, which became very profitable. About the year 1830 he was building and running steamboats on his own account, and rapidly accumulating wealth. In 1851 he founded a steamship line from New York to California by the Nicaragua route, and was president of the company engaged in this enterprise. In connection with this line he succeeded in warping the steamboat *Central America* up the San Juan river, and through the Castillo rapids, placing her in lake Nicaragua for the transportation of passengers and freight; a feat which had been deemed impossible. Mr. Vanderbilt's extended connection with steamboats and steamships gave him the *soubriquet* of the "commodore," a title which clung to him till his death. In 1853 he built the steamer *North Star*, on which he took his family for a trip to Europe. Two years later he founded an independent line of steamships to Havre, and built the *Ariel* and *Vanderbilt* for this route. In 1862 he presented the *Vanderbilt*, which cost \$800,000, to the U. S. government, for use during the war; an act for which he received the thanks of congress, while a gold medal was struck in his honor and duly presented to him. Mr. Vanderbilt turned his attention to the railroad business in 1857, connecting himself with the Harlem railroad, to which he advanced large sums of money, and of which he became president. He next undertook to re-organize the Hudson River railroad; purchased St. John's park in New York for \$1,000,000, and erected there a freight depot; and by his skillful and energetic management of these two lines soon placed them on a firm financial basis. In 1868 he became president of the New York Central railroad; which, in the following year, he consolidated with the Hudson River road, and formed of these two, with their connections, the most important trunk line in the country. He eventually laid four tracks on the line of this great system, thus enabling the transportation of grain from the w. on a scale otherwise impossible. Mr. Vanderbilt grew to be considered the foremost railroad magnate in America. His wealth had accumulated to a vast extent, and was dispensed liberally. He founded, in 1873, the Vanderbilt university at Nashville, Tenn., at a cost of more than \$1,000,000. He was simple and unostentatious in his manners, fond of horses, and of the game of whist; devoted to magnificent operations in the direction of increasing the possibilities of American commerce.

VANDERBILT, WILLIAM HENRY, b. N. J., 1821; son of Cornelius. In the latter years of commodore Vanderbilt's life he relied greatly on the knowledge and judgment of his son William, who, on the death of his father, assumed the offices of president of the N. Y. Central and Hudson River, and New York and Harlem railroads. He conducted these complicated enterprises with such success that his name grew to become one of the three or four so-called "railroad kings" of America. In Jan., 1880, Mr. Vanderbilt parted with a large block of his stock in the N. Y. Central railroad, being 250,000 shares at 120, amounting to \$30,000,000; the largest cash transaction in railroad securities ever made. Mr. Vanderbilt is also president of the Canada Southern and the Lake Shore and Michigan Southern railroads. He has contributed handsomely to the Vanderbilt university at Nashville, Tenn., founded by his father, and is a patron of the fine arts.

VANDEBURGH, a co. in s.w. Indiana, having the Ohio river for its s. boundary; 250 sq. m.; pop. '89, 42,193—33,685 of American birth, 3,833 colored. Co. seat, Evansville.

VAN DER GOES. See GOES.

VAN DER HEYDEN. See HEYDEN.

VAN DER HOEVEN. See HOEVEN.

VANDERLYN, JOHN, 1776-1852, b. New York; studied under Gilbert Stuart, and afterward in Paris by the assistance of Aaron Burr. In Italy he made many copies from the old masters, especially Correggio and Raphael. He lived in Europe, 1808-15. His "Marius seated amid the ruins of Carthage," was awarded the gold medal at the Louvre in 1808. In 1832 he began to paint a full length portrait of Washington for the hall of the house of representatives, and in 1839 the "Landing of Columbus" for the rotunda of the capitol.

VAN DER MEER, JAN, the elder, 1627-85 (abt.), b. Rotterdam; a Dutch painter, excelling especially in small landscapes and sea-pieces, and showing perfect knowledge of the construction of ships. His coloring is brilliant and has been compared with that of Claude Lorraine. In 1664 he was elevated to the deanship of the painters of Amsterdam.

VAN DER MEER, JAN, the younger, abt. 1660—abt. 1704; b. Haarlem. A Dutch landscape painter of great merit supposed by some to have been a son of the preceding. He was a pupil of Berghem, whose style he adopted and in painting sheep, which predominate in his pictures, has scarcely been equaled. He excelled also in pen-and-ink sketches and etching.

VANDERVELDE, ADRIAN, 1639-72; b. Amsterdam; a Dutch landscape painter who excelled in rendering the effects of light upon trees and other objects, and was so distinguished for his drawing of cattle and figures that he was often employed to introduce these into the pictures of great masters, as Hobbema, Ruysdael, Wynants, etc.

VANDERVELDE, WILLIAM, commonly called the elder, in distinction from his son of the same name, was born in 1610 at Leyden. He was bred a sailor; and having a natural aptitude for art, he busied himself in drawings of marine subjects. These becoming known, were seen to be of great merit; and in 1666 he was chosen to sail with the fleet of the famous admiral de Ruyter, with a view to the commemoration on canvas of his exploits against the English. The sketches which he produced of several engagements which he witnessed procured him a great reputation; and in 1675 he was induced to settle in England as painter of sea-fights to Charles II., who allowed him a pension of £100 a year. On the death of Charles his services were retained at the same rate by his successor, James II. He died in London in 1693, and was buried in St. James's church-yard. His works were mostly colorless drawings, of great beauty and precision, many of which were afterward painted upon in oil by his much more famous son.

VANDERVELDE, WILLIAM, the younger, who was born at Amsterdam, in 1633. He received his education in art from his father, whom he followed to England. The designs produced by the father, the son was employed to color; and for this service, to him also a pension of £100 a year was assigned. This official and subsidiary employment was, however, the least important part of his activity, his time being mainly devoted to the series of original works which have given him assured rank as one of the greatest of marine painters. In his rendering of the ocean, in its various moods, Vandervelde has had few equals; and his works are now highly valued by the connoisseur. The best of them are to be found in England, the gallery at Bridgewater house being particularly rich in fine specimens. Vandervelde lived for the most part with his father at Greenwich; and after his death, in London, where, in 1707, he died.

VAN DIE'MEN'S LAND. See TASMANIA.

VANDYCK. See DYCK.

VANE, Sir HENRY, a notable English politician of the 17th c., was born in 1612. His father, also a sir Henry, was a distinguished statesman in the reigns of king James I. and Charles I., and received many proofs of the royal favor; but having taken part in the prosecution of Strafford (q.v.), he was deprived of all his offices of honor and emolument. When the parliament rose against the king, Vane remained neutral; and some time before the execution of Charles, he withdrew to his seat at Raby castle, where he died in 1654.—Sir HENRY VANE, the younger, studied at Westminster and Magdalen hall, Oxford, where he appears to have embraced, with all the inconsiderate enthusiasm of his character, those republican principles for which he afterward became so famous. His travels in France and Switzerland strongly confirmed him in his aversion to the government and discipline of the church of England, and in 1635 he sailed for New England—the refuge of disaffected spirits in those days. He was soon after chosen by the people governor of Massachusetts; but his predilections in favor of "antonomian" opinions soon robbed him of his popularity, and in 1636, or thereabout, he returned home. He now married a daughter of sir Christopher Wray of Ashby, in Lincolnshire, and entered on a political career. Through his father's interest, he was appointed treasurer of the navy, along with sir William Russell, and entered parliament for Kingston-upon-Hull, in 1640, but almost immediately joined Pym and the anti-court party, of which he became one of the most vehement and resolute leaders. When the civil war broke out, no man was more conspicuous in the military and theological politics of the time than Vane. He carried to the house of peers the articles of impeachment against archbishop Laud; he was a member of the Westminster assembly; a "great

contriver and promoter of the solemn league and covenant" (though in his heart he abhorred both it and presbytery, and only used them as a means of crushing the bishops); the chief instrument in carrying the "self-denying ordinance" (1644); and one of the commissioners at the treaties of Uxbridge (1644-45) and the isle of Wight (1648). But he did not view with satisfaction the increasing power of Cromwell and the army. He was too extravagant a parliamentarian, too much of a visionary and enthusiast to be pleased with the supremacy of the musket and saber, and for some time he withdrew altogether from public affairs. On the establishment of a commonwealth, however, in Feb. 1649, Vane was appointed one of the council of state; yet his antipathy to Cromwell and his factious, pragmatical, hair-splitting activity so much increased, that the former, who looked upon Vane as a subtle promoter of divisive courses, called him a "juggling fellow;" and was probably in deep earnest, when, at the dissolution of the commons, in April, 1653, against which Vane protested with a sort of feminine sharpness, he cried out: "The Lord deliver me from sir Harry Vane!" In 1656 Vane wrote a book, entitled *A Healing Question Propounded and Resolved*, which was so hostile to Cromwell's protectorate, that it was found necessary to imprison the author in Carisbrooke castle, isle of Wight. He was released after a detention of four months, and attempts were made by Cromwell to win him over, but Vane was inflexible in his fanaticism; and during the rule both of Cromwell and Richard, he maintained an attitude of sullen discontent. After meddling a little in the helpless intrigues that followed the abdication of Richard, he was ordered by parliament to withdraw to his house at Raby. When the restoration took place, Vane was one of the 20 persons excluded from the *Act of General Pardon and Oblivion*; and in July, 1660, he was committed to the tower. On June 2, 1662, he was arraigned and indicted of high treason before the Middlesex grand jury, found guilty (on the 6th), and on the 14th was beheaded on Tower hill. His son was knighted by king Charles, and raised to the peerage by king William as lord Barnard of Barnard castle. Vane was a subtle, restless, crotchety, unwise kind of man—a real thorn in the flesh of the great Cromwell. He was one of the fifth monarchy sect, and much given to extravagant religious musings, and to praying (with his friends) in language wholly unintelligible. He also wrote several political and theological treatises, which do not require special mention.—See *The Life and Death of Sir Henry Vane, Knight* (London, 1662); *Birch's Lives*; and *Ludlow's Memoirs*.

VANGS, ropes on either side of a gaff, for steadying, or acting as braces to, a fore-and-aft sail.

VANILLA, a genus of parasitical *orchideae*, natives of tropical parts of America and of Asia, which spring at first from the ground, and climb with twining stems to the height of 20 or 30 ft. on trees, sending into them fibrous roots produced from nodes, from which the leaves also grow. These roots, drawing sap from the trees, sustain the plant, even after the principal root has been destroyed. The stem is four-cornered and juicy; the leaves long and fleshy. The flowers are in spikes, and are very large, fleshy, and generally fragrant. The fruit is a pod-like, fleshy capsule, opening along the side. The *vanilla* of commerce was formerly supposed to be the fruit of *V. aromatica*, a native of tropical America, but is now ascertained to be chiefly, if not wholly, the fruit of *V. planifolia*, a species indigenous to Mexico, Guiana, Brazil, Peru, etc., and cultivated also in some of the West India islands, the Mauritius, and Ceylon. The fruit is cylindrical, about a span long, and less than half an inch thick. It is gathered before it is fully ripe, dried in the shade, and steeped in a fixed oil, generally that of the cashew nut. It contains within its tough pericarp a soft black pulp, in which many minute black seeds are imbedded. Vanilla appears in commerce in packets of 50 to 100 pods, wrapped up in cane-leaves and sheet-lead, or in small tin boxes. It has a strong, peculiar, agreeable odor, and a warm sweetish taste. The interior pulp is the most aromatic part. Benzoic acid is sometimes so abundant in it as to effloresce in fine needles. Vanilla is of little use in medicine, although it is a gentle stimulant and promotes digestion, and in large doses is said to be a powerful aphrodisiac; but it is much used by perfumers, and also for flavoring chocolate, pastry, sweetmeats, ices, and liquors. Balsam of Peru is sometimes used as a substitute for it, as it is expensive, and the whole quantity imported into Britain does not exceed four or five cwt. annually. It is in very general use in South America. Several kinds are distinguished in commerce. The best is that called *leg or lee*, which is almost of a black color, and covered with crystals of benzoic acid. Another kind, less fragrant, dryer, and of a darker color, is known as *sinarona*. A still inferior kind, with much broader, brown capsules, is called *pompona*, or *bova*. When the fruit of vanilla is fully ripe, a liquid (*baume de vanille*) exudes from it which is unknown in Europe, but is valued in Peru. Vanilla has ripened its fruit in British hot-houses, but the flowers are apt to fall off without fruit being produced, unless care is taken to secure it by artificial impregnation. This is, in some measure, the case even in the East Indies, and in some parts of America itself; and it is supposed that the presence of some insect, delighting in the flowers of the vanilla, makes it more productive in other parts of America, especially in Mexico.

VAN LENNEP, HENRY JOHN, D.D., b. Smyrna, 1815; sent to the United States for education at the age of 15; studied at the Mt. Pleasant institution, Amherst, Mass.; graduated, Amherst college, 1837; studied theology at Andover; sailed as a missionary

of the American board to Turkey, 1839; stationed in Constantinople, Smyrna, and Tocat in connection with educational institutions; traveled in Greece, Palestine, and Egypt; returned to the United States, 1869, and has charge of a boys' family boarding-school, Great Barrington, Mass. He has published *Travels in Asia Minor; Bible Lands*.

VANLOO, CHARLES ANDRÉ, younger brother of Charles, was born in 1705, at Nice. As a boy, he was with his brother at Rome, and studied under Benedetto Luti. He accompanied his brother in 1719 to Paris, where, after some little interval, in which he was employed as a decorative artist at the opera-house, he betook himself to portrait painting. He returned in 1727 to Rome, and there he executed some works which laid the basis of his future reputation, procured him, through the influence of the cardinal De Polignac, a pension from the king of France, and in 1729 the title of cavaliere from the pope. On leaving Rome, he visited Turin, painted there for the king of Sardinia a series of subjects from the *Jerusalem Delivered* of Tasso, and returned to Paris in 1734. The year following he was made a member of the academy, and his subsequent career was one of full prosperity. Tempting offers were made him by Frederick the great, who desired to have him in his service; but he declined them in favor of a nephew, preferring to remain in Paris. In 1751 he was made by Louis XV. a knight of the order of St. Michael; and in the course of the same year he became director of the academy. In 1762 he was made chief painter to the king, and three years after he died. As the last really great specimens of the old French school of historical painting, his works have still their admirers.

VANLOO, JEAN BAPTISTE, a member of a family originally Flemish, in which a love of art seemed indigenous, was born at Aix in Provence, in 1684. His grandfather and father were both painters of some talent, and under the instruction of the latter, while yet a mere boy, he is said to have attained considerable proficiency as an artist. Subsequently he settled himself as such at Nice, and afterward at Toulon, where he married the daughter of an advocate. On quitting Toulon, on the occasion of its being besieged by the duke of Savoy in 1707, he returned to his native place, and abode some years there. He was again at Nice in 1712, and in the year following he visited Genoa and Turin. At the latter of these cities he won the favorable regard of the prince of Corignano, son-in-law of the duke of Savoy, and was sent by him to study at Rome as a pupil of Benedetto Luti. After a further residence at Turin, he proceeded in 1719 to Paris, where apartments were assigned him in the hôtel of the prince his patron. Here he speedily acquired a great reputation as a portrait-painter. He was made a member of the academy in 1731, and professor of painting in 1735. The loss of a large sum of money in the Mississippi scheme induced him to come, in 1738, to London, where his portraits soon distanced all rivalry. His health, however, having given way, he retired in 1742 to his native district, Provence, where he died in April, 1746.

Though chiefly eminent in portrait, Vanloo had also considerable talent as a painter of historical subjects, and executed many works of this kind, in some of which a distinct merit is still recognized.

VANNES, a sea-port town of France, capital of the department of Morbihan, stands at the mouth of the Vannes, which falls into a narrow inlet of the gulf of Morbihan, 310 m. w.s.w. of Paris by railway. The town is surrounded by high walls flanked with towers. The cathedral is the most important edifice. Manufactures of linen and woolen cloth and ship-building to some extent are carried on, as well as commerce in honey, wax, wine, and hemp. Pop. '76, 15,716.

VANNUCCI PIETRO, See **PERUGINO**, *ante*.

VAN OOSTERZEE, JAN JACOB, b. Holland, 1807; educated at Utrecht, and became a minister of the Reformed church. He was a minister of the most important church in Rotterdam, and gained a high reputation as a pulpit orator, 1844-62, when he was appointed professor of systematic and practical theology at Utrecht. Among his works are *The Life of Jesus*; *Theology of the New Testament*, and *Christian Dogmatics*.

VAN RENSSELAER, CORTLANDT, D.D., 1808-60; b. N. Y.; graduated Yale college, 1827; admitted to the bar, 1830; studied theology at Princeton seminary; ordained, 1835; preached in Virginia; pastor of First Presbyterian church, Burlington, N. J., 1837; corresponding secretary of the board of education of the Presbyterian church, whose affairs he conducted with great efficiency; agent for Princeton college, for which he raised \$100,000. He contributed largely to the *Presbyterian Magazine*, which he had founded; and published addresses, sermons, and essays. A posthumous volume of *Essays and Discourses, Historical and Practical*, was edited by his son.

VAN RENSSELAER, HENRY KILLIAN, 1744-1816; b. N. Y.; col. of a N. Y. regiment in the revolution. In 1777 he repelled an assault by the British near fort Ames, but retired on the evacuation of Ticonderoga by gen. St. Clair. He participated in the operations about Saratoga, and was dangerously wounded. A mutiny in his regiment, caused by the disputes between New York and New Hampshire, was suppressed by Washington.

VAN RENSSELAER, STEPHEN, known as "the Patroon," an American statesman, and patron of learning, was b. N. Y., Nov. 1, 1769, the fifth in descent from Kiliaen Van Rensselaer, the original patroon or proprietor of the Dutch colony of Rensselaerwyck,

who in 1630, and subsequently, purchased a tract of land near Albany, 48 m. long by 24 wide, extending over three counties. He was educated at Princeton and Harvard colleges, and married a daughter of gen. Philip Schuyler, a distinguished officer of the revolution. Engaging early in politics, at a period when they were the pursuit of men of the highest social position, he was, in 1789, elected to the state legislature; and in 1795, to the state senate, and became lieutenant-governor, president of a state convention, and canal commissioner. Turning his attention to military affairs, he was, at the beginning of the war of 1812, in command of the state militia, and led the assault of Queenstown; but the refusal of a portion of his troops, from constitutional scruples, to cross the Niagara river, enabled the British to repulse the attack, and the gen. resigned in disgust. As president of the board of canal commissioners for 15 years, he promoted the New York system of internal improvements; as chancellor of the state university, he presided over educational reforms; and as president of the agricultural board, aided to develop the resources of the state. At his own cost, he employed professors Eaton and Hitchcock to make agricultural surveys, not only of his own vast estates, but of a large part of New York and New England, the results of which he published in 1824; he also paid prof. Eaton to give popular lectures on geology through the state. In 1824 he established at Troy an institution for the education of teachers, with free pupils from every county. Widening the sphere of his political interests, he went to congress in 1823, and served several terms, exerting a powerful influence, and securing the election of John Quincy Adams as president of the United States. After an active, useful, and honorable career, worthy of his high position, he died at Albany, Jan. 26, 1839.

VAN SCHAIK, GOZEN, 1737-89; b. Albany, N. Y.; was in the expedition against Crown Point in 1756, and in the French, Indian, and revolutionary wars. In the latter he was sent to Cherry Valley to protect that settlement from the depredations of the British and Indians. He was engaged in the battle of Monmouth, and for his services in the war with the Onondaga Indians received the thanks of congress; brevetted maj.gen. 1783.

VAN VEEN, OTTO (called also OTTOVENIUS), an eminent painter, was a native of Leyden, of which city his father was a wealthy burgomaster. The exact year of his birth is involved in some obscurity; but there seems tolerable evidence to fix it as about 1556-57. He received a careful education, and in aid of the natural talent he displayed for drawing, the best masters were procured him. When about 15 years old he was sent to Liège, whence, after a residence of three years, he proceeded to Rome, where he became a pupil of the celebrated Zuccherò. In Italy he remained about eight years; and on his return home by way of Vienna, the emperor, by tempting offers, vainly endeavored to detain him in his service. It is significant of the estimation in which he had come to be held as an artist, that on his passing through Munich and Cologne, similar offers were pressed upon him. These also, however, he declined, wishing to settle in his native country. Finally, he went to reside at Brussels, as painter to the famous Alexander Farnese, duke of Parma, and then governor of the Spanish Netherlands, of whom he executed a masterly portrait in armor, which greatly increased his reputation. The duke having died, he established himself at Antwerp, and opened an academy, at which the great Rubens was one of his pupils. In the matured art of Rubens, traces of his master are still, it is thought, to be detected; and in particular, he is held to have in all probability derived from him that fondness for allegorical and emblematic subjects which possessed him not always to his advantage. On the occasion of the entry into Antwerp of the new governor, the archduke Albert of Austria, Van Veen was employed to design the arches and the other decorative business of the ceremonial, and so pleased was the duke with the taste and invention displayed, that he appointed him master of the mint at Brussels, to which city he returned to reside. An invitation to Paris was subsequently sent him by Louis XIII., but this he saw fit to decline; and in Brussels, at the age of 78, he died.

The chief works of Van Veen are religious pictures for churches. In the cathedrals of Leyden, Antwerp, and Bruges, good specimens may be found. On their own account they deserve attention; but it is chiefly as "the work of a man who had the honor to be the master of Rubens" (to quote the words of Reynolds), that they now for the most part receive it.

VANVITELLI, LUIGI, 1700-73; b. Flanders; at first a painter, but studied architecture under Ivara, and drew designs of great merit. He was chosen by the king of Naples as architect of the Caserta palace, one of the finest buildings of the century: he also had charge of the construction of the great aqueducts of Naples, and of several churches.

VAN WERT, a co. in w. Ohio, bounded on the e. by the Miami canal; 400 sq.m.; pop. '83, 23,030—21,633 of American birth. Co. seat, Van Wert.

VAN ZANDT, a co. in n.e. Texas, bounded on the n.e. by the Sabine river; 900 sq.m.; pop. '80, 12,619—12,497 of American birth, 1163 colored. Co. seat, Canton.

VAPEREAU, LOUIS GUSTAVE, b. France, 1819; educated at the Orleans college and the Paris normal school. He lectured on philosophy at the college of Tours for ten years; studied law, and became advocate in 1854. The first edition of his *Dictionnaire*

des Contemporains appeared in 1858; three editions have since been published, and a new one is now (1881) in course of publication. He has also published a *Dictionnaire Universel des Littérateurs*, and is the editor of the annual *L'Année Littéraire et Dramatique*.

VA'POR. As all *solids*, with the exception of carbon (an exception most probably due to our not being able to produce a sufficiently high temperature), are melted, or rendered *liquid* by the application of heat (q.v.), so a further application of heat converts them into *vapor*. A vapor is really a gas, but it requires a little consideration to convince ourselves of the fact. Perhaps the best proof that can be given is that supplied by the beautiful experiments of Faraday (q.v.) and others on the liquefaction of gases. Hydrogen, oxygen, and nitrogen were long exceptions; but now all gases have been liquefied by a proper application of pressure or cold, or of cold and pressure combined. The difference, in common language only, between a vapor and a gas is this: A gas is a substance which at ordinary temperatures and pressures exists in a state of vapor; while a vapor is produced by the application of heat to a substance which is ordinarily found in the solid or liquid form. In other words, gases are the vapors of substances which, in the liquid form, boil at very low temperatures.

The most familiar instance of vapor is aqueous vapor, or steam (q.v.). At all temperatures, even as low as the freezing-point, ice and water give off vapor; and the quantity produced is determined by the temperature alone; that is, evaporation (q.v.) at any temperature continues (more or less slowly according to the quantity of air or other gas which is present) until the pressure exerted by the vapor upon the containing vessel attains a certain definite value, depending on the temperature alone. If the temperature be such that the corresponding vapor-pressure is equal to the pressure of the air, vapor comes off freely, and we have the phenomenon called boiling.

Vapor in a vessel which contains some unevaporated water is thus always *saturated*, as it is called, i.e., the full amount of vapor capable of existing at the temperature of the vessel is present. If it be compressed, some is liquefied; if allowed to expand, more vapor is formed.

If, however, there be no water present in the liquid form, and the temperature be gradually raised, the pressure of the vapor will rise, but much more slowly than when water is present, because no more vapor can be formed. In this state—that of *superheated steam*—vapor behaves almost exactly as an ordinary gas.

Chlorine, carbonic acid, sulphurous acid, etc., thus exist at ordinary temperatures as *superheated vapors*; and can therefore be reduced by cold and pressure to the condition of *saturated vapor*, when they are easily liquefied by carrying the process further.

Aqueous vapor may be liquefied by cold alone, or by pressure alone, as we have seen; and at ordinary temperatures it is easy to liquefy sulphurous acid, ammonia, and even carbonic acid and laughing gas, by mere compression. Gases absorbed by charcoal, or by spongy platinum, i.e., condensed by intense molecular forces on the large surface presented by the interstices in these bodies, must in all probability exist in the state of liquids. Carbonic acid is liquefied when exposed to a pressure of 35 atmospheres at ordinary temperatures; and some varieties of charcoal absorb from 80 to 100 times their bulk of this gas. Remembering that, on account of the impenetrability of matter, the gas can only be in the *pores* of the charcoal, and that their whole bulk forms but a small fraction of that of the charcoal itself, we see that in all probability the absorbed gas must be condensed so enormously as to have become liquid. It is probable that in Graham's recent process, for separating by dialysis (see Osmose) the oxygen and nitrogen of the atmosphere, the film of vulcanized india-rubber which is employed as septum compels these gases to pass through its pores in a liquid form.

Some extraordinary experiments, due to Cagniard de la Tour (the inventor of the Sirène, q.v.), have given us valuable information on the subject of vapors. He showed that when water, ether, and other liquids are hermetically sealed in glass tubes, so as to fill from a quarter to a half of the tube, the application of the requisite amount of heat is sufficient to convert the whole into vapor. This vapor, therefore, has a density equal to half or quarter of that of the liquid! Ordinary steam from boiling water has only about $\frac{1}{1700}$ of the density of water (in common language, a cubic inch of water gives a cubic foot of steam). These experiments are very dangerous.

Some important experiments of this nature are due to Andrews. Having, by mere pressure, partially liquefied carbonic acid in a glass tube, he raised the temperature gradually, and observed that the demarkation between the liquid and the gas became less and less definite; the capillary curvature of the surface of the liquid also diminishing. At about 88° Fahr., the liquid surface became horizontal, and the liquid disappeared. The tube then appeared to be filled with a homogenous substance, neither gaseous nor liquid; apparently a new state of matter. When the temperature was slightly diminished, or the pressure relaxed, there was a singular appearance of flickering striæ, such as one sees on mixing alcohol and water, or on looking through the column of irregularly heated air rising from a hot body. No pressure that Andrews could apply, not even 400 atmospheres, could liquefy this gas when its temperature was above 88° Fahr. It appears that for every gas there is a point of temperature above which it is impossible by any amount of pressure to liquefy it.

The so-called permanent gases—oxygen, hydrogen, and nitrogen—have at last yielded

to the patience and skill of M. Pictet of Geneva and M. Cailletet of Paris, and have been liquefied, or even solidified. In the last months of 1877 oxygen was liquefied under a pressure of 500 atmospheres; hydrogen, when subjected to a pressure of 280 atmospheres; and nitrogen, under a pressure of 200 atmospheres.

VAR. a department in the extreme s.e. of France, bounded on the s. and s.e. by the Mediterranean, and on the n.e. by the department of Alpes Maritimes. See ALPES MARITIMES. Area, 2,348 sq.m.; pop. '76, 295,763. The department receives its name from the river Var, which formerly served as its boundary on the e., but which, since the arrondissement of Grasse was taken from the department of Var, and added to that of the Alpes Maritimes, now belongs entirely to the latter. Var is well watered by a great number of streams, of which the chief are the Gapau, Argens, and Bianson. In the n. and n.e. it is mountainous, being traversed by a branch of the *Alpes de Provence*, called the *Monts de l'Estéril*. Between the mountains and the water-courses are many very fertile valleys. The climate of Var, tempered by the altitude of the surface, is pleasant. Fruits of all kinds are here cultivated with remarkable success; tobacco is grown, and 17,600,000 gallons of wine are produced annually. The department abounds in minerals: an active commerce is carried on, the exports being chiefly wine, fruits, olive-oil, and other agricultural and horticultural products. It is divided into the three arrondissements of Draguignan, Brignoles, and Toulon. Capital, Draguignan.

VARANGIANS (Ger. *Wäräger*, or *Wäringer*), a Norman people of the Baltic coast, who greatly damaged by their piracies the commerce of the republic of Novgorod, and subjugated repeatedly the Slavic and Finnish peoples of northern and central Russia. They forced the Krivitches, Tschudes, and other tribes to pay tribute, and wrested from the Russians the districts now known as Revel, Petersburg, and Archangel; the Russians retreating into Finland and Karelia. Gradually the two nations became intermixed, and toward the 9th c., the names Russian and Varangian appear to have been considered synonymous. In 832, the rulers of this Russo-Varangian nation, Rurik (q.v.). Sineous, and Truvor, were invited by the federative state of Novgorod, in which the Slaves were dominant, to put themselves at its head, and Rurik accepting the invitation, founded the Russian monarchy. See RUSSIA. The Varangians were at first distinguishable in various ways above the other peoples of the Novgorod state; but being far inferior in number, were soon forced to adopt the Slavic tongue, conform to Slavic manners, and so become merged in the predominant population. The great success which attended this experiment of the Novgorod confederacy, induced other Slavic states which were located on the Dnieper to put themselves under the protection of the warlike Varangians; and accordingly we find, soon after 862, a second Slavic state at Kiev, under the rule of Oskold, a Varangian chief, and the conqueror of the barbarous Chazars. After Rurik's death, his successor in power, the Regent Oleg, united Kiev to Novgorod, making Kiev the capital—a position it held till supplanted by Moscow (q.v.).

VARANIDÆ, a family of saurian reptiles, having a very elongated body, without a dorsal crest; strong legs, and long unequal toes; the tail long and slightly compressed; the scales tuberculous, and arranged in rings; the tongue protractile, dividing into two points as in serpents. Some of them are aquatic, and some inhabit dry and sandy places. The terrestrial species have the tail conical; the aquatic species have it compressed and often crested, so that it becomes a powerful organ of locomotion in water. The motion of the terrestrial species is aided by the tail, and is always serpentine. Some of the varanidæ attain a large size. They feed on animal food of any kind, and have been seen to attack a young deer swimming across a river. The species are not numerous, and belong chiefly to the eastern hemisphere.

VARAZZÈ, a small t. of northern Italy, on the gulf, and 18 m. s.w. of the city of Genoa. Some trade in wood and extensive construction of fishing-boats are here carried on. Pop. of town, 5,000.

VARDÖE, an island in the Arctic ocean, off Finland. lat. 70° 20' n., long. 21° 10' east. It belongs to Norway. Its fortified town, Vardöhus, is the most northerly town in Europe.

VA REC, an old name for crude carbonate of soda.

VARESE, a t. of northern Italy, in the province of Como, and 13 m. w. of the town of that name. It is a handsome town; contains a number of fine palaces and magnificent villas; and carries on manufactures of silk, cotton, paper, and hats. Pop. 12,600. Varese is of very ancient origin. The Romans kept it strongly garrisoned as a stronghold against invasion from the north.

VARGAS, LUIS DE, 1502-68; b. Seville, Spain; studied art in Italy and for many years resided in Rome. On his return to Seville he painted many frescos, altar pieces, etc., for the churches. Of these the best, still preserved in his native city, are "La Generacion," "Jesus bearing the Cross," and "Adam and Eve." His portrait of the duchess of Alcalá is one of the finest works of art of the century.

VARIATION, in music, a transformation of a melody by melodic, harmonic, contrapuntal, and rhythmic changes. The subject chosen is called the theme; it is first simply harmonized with or without an introduction, and then repeated in a variety of different

transformations and the variations collectively with the theme constitute the piece. Occasionally the different variations are combined by an intermediate passage; but generally each has its separate close, and the whole terminates with an extended and richly developed variation, or a coda.

VARIATION OF THE COMPASS. See TERRESTRIAL MAGNETISM.

VARICELLA (Lat. a little pimple), popularly known as chicken-pox (q.v.).

VARICK, RICHARD, 1753-1831; b. Hackensack, N. J.; practiced law in New York city before the revolutionary war, and entering the army commanded a company, became military sec. to gen. Schuyler commanding the northern army, and filled other responsible offices until the capture of Burgoyne 1777. In that year he was appointed inspector gen. at West Point, holding the post until Arnold's treason was exposed; then became recording sec. at Washington's headquarters, with the rank of col. He was recorder of the city of New York, 1783-89; atty. gen. of the state, 1789, afterward mayor of the city. Associated with Samuel Jones, he revised the state laws in 1786. He was one of the founders of the American Bible society, and its president, succeeding John Jay.

VARICOCELE (known also as **CIRCOCELE**) is a term used in surgery to designate a varicose state of the veins of the spermatic cord. It is caused by the same conditions which give rise to varicose veins (q.v.) elsewhere—viz., weakness of structure, combined with obstruction through corpulence, constipation, etc., to the return of the venous blood. For a description of its symptoms, and of the suitable treatment, we must refer to any ordinary text-book of surgery.

VARICOSE VEINS. When a vein becomes dilated at a certain part of its course, for no apparent physiological object, such as relieving the venous circulation elsewhere (as, for example, in the case of the superficial abdominal veins enlarging in order to relieve a compressed vena cava), it is said to be varicose, the actual dilatation being called a *varix* (a word used in this sense by Cicero and Celsus). Some veins seem to be unaffected by varices, which, however, are of common occurrence in the sub-mucous veins of the rectum (constituting hemorrhoids or piles), in the spermatic veins, giving rise to varicocele (q.v.), and in the veins of the lower extremities. They are occasionally (but very rarely) found in other veins. Certain conditions of the system favor the formation of varices, among which may be noticed an indolent temperament, and a debilitated condition of the general system, accompanied by a relaxed state of the walls of the veins; and possibly also a congenital predisposition or hereditary tendency. Persons with such a predisposition are more likely to suffer from this affection if their occupation is one which involves much standing or walking; and cooks, washer-women, and foot-soldiers have been selected as specially prone to varicose veins. Varices may occur at almost any period of life, but are chiefly developed during middle age. Their formation is aided by any condition of the system which impedes the circulation, as certain diseases of the heart, lungs, and liver; and by continued *high living*, which is especially liable to induce hemorrhoids. From the researches of Andral, it appears that in varicose veins the coats of the dilated vessels may become thickened or may become thin; that they may be lengthened so that the veins become tortuous; and that the dilatation may be unequal, giving rise to the formation of pouches; and that, in consequence of the enlarged caliber of the vessels, the veins only act imperfectly, and gradually undergo degeneration. Varices occurring in the leg, to which our remaining observations apply, commonly give rise to deep-seated aching pain in the limb, with a sense of weight, fullness, and numbness, before there is any external appearance of the affection. In a more advanced stage, the ankles swell in the evening, and the feet are always cold. After a time, a small tumor of a bluish tint appears, which disappears on pressure, but returns on the removal of the pressure, and is caused by a dilating vein. This dilatation extends, and forms knotty, irregular tumors, soft to touch, diminishing on pressure, or on the patient's assuming a horizontal posture, and giving a bluish tint to the adjacent skin. These tumors commonly occur in the middle of the leg, along the track of the saphena veins, but they often extend along the whole of the leg and thigh. With regard to treatment, it may be mentioned that old varices cannot be cured, except by operations dangerous to life, although much may be done for their relief. In their earlier stages, they are, however, more amenable to treatment. As the disease is a very common one, we shall enter somewhat in detail into the palliative treatment which any one may adopt for himself. The venous circulation of the limb should be as much possible facilitated by the disuse of garters; by keeping the limb (if the means and condition of the patient permit it) in a horizontal position for a month or six weeks; by prohibiting walking, and allowing only carriage-exercise, with the leg elevated to the horizontal position. The limb should also be carefully bandaged from the toes to above the knee, the bandage being replaced daily, and the limb then well rubbed with the hand, or with a flesh-brush, for ten minutes or more, from below upward, so as to stimulate the circulation. When the circumstances of the patient hinder this treatment, elastic stockings may be tried during the day, or ordinary bandages, with a pad of lint placed on each varicose cluster before the bandage is applied. In cases where only one or two trunks are affected, the disease may be prevented from extending by the application of pieces of wash-leather spread with soap-plaster firmly over them. At the same time, the general

health must be attended to. Ill-nourished, feeble patients must be treated by tonics and nourishing diet; while over-fed, plethoric patients require mild but often repeated purgatives to relieve the portal circulation. In the numerous cases in which there is a relaxed condition of the veins, the tincture of sesquichloride of iron may usually, be given with advantage in half-dram doses thrice daily in half a tumbler of water, with a colocynth pill every second night, to obviate the constipating action of the iron. Among the means of effecting a *radical cure*, by causing coagulation of the blood in the dilated veins, when they shrink and contract permanently, are (1) caustic potash applied over the course of the vessel, (2) subcutaneous incision of its walls, and (3) compression of the vessel between a steel pin and a twisted suture. We believe that the cases are rare in which the pain of the varix is so great as to disqualify a patient from his ordinary work, and these are the only ones in which any of these operations should be recommended; "and the patient," says Mr. Callender, "if wise, will be contented with the palliative measures of a more simple character."—Holmes's *System of Surgery*, vol. iii., p. 321. Among the troublesome consequences of varicose veins are the obstinate ulcers, known as varicose ulcers, to which they give rise; and it must be borne in mind that occasionally, when the skin gets thinned by prolonged pressure, the varices burst through it, and give rise to hemorrhage, which, if not promptly stopped, may cause fainting, and even death. When such an accident occurs, the patient should at once be placed in a horizontal position, and the leg raised, in which case the bleeding will probably cease. If it continue, a pad of lint must be pressed upon the mouth of the bleeding vessel by means of a few turns of a bandage round the limb.

VARIETY, in natural history, a term employed to designate groups subordinate to species (q.v.). Varieties are regarded as less permanent than species; and those who regard species as perfectly distinct in their origin, look upon varieties as modifications of them due to particular causes. Of course those who adopt Darwin's view of species do not deem the distinction between species and varieties so important, but rather consider varieties as species in process of formation. However this may be, all naturalists acknowledge a difficulty of deciding what are varieties and what are species; and some reckon as varieties what others regard as distinct species. The whole subject is involved in difficulty, and must be studied both with respect to general principles, and to the peculiarities of particular cases. Whatever theory may be adopted, many of the groups now distinguished by particular names are doubtful, and their designations must be regarded as merely provisional. It cannot be certainly said whether they are varieties or species. The term *variation* has been employed by some authors to designate forms less permanent than varieties, but the term has not obtained general acceptance.

VARINAS, a t. of Venezuela, on the San Domingo, 90 m. s.e. of the nearest shore of lake Maracaybo. It stands at the entrance to a valley covered with tobacco-plantations. Varinas carries on a trade in tropical productions and in cattle. Pop. stated at 5,000.

VARIOLA. See SMALL-POX.

VARIX. See VARICOSE VEINS.

VARNA, an important sea-port of the principality of Bulgaria, on the northern side of a semicircular bay, an inlet of the Black sea, 180 m. n.w. of Constantinople. The congress of Berlin in 1878 decided that the strong fortifications by which the port was formerly defended should be destroyed. Varna stands on a sandbank, and the city wall, the base of which in some places is 20 or 30 ft. above sea-level, is in other places on a level with high-water. The town itself is crooked, irregular, dirty, and dilapidated, and as viewed from the sea, it presents a huge jumble of red-tiled houses, interspersed here and there with mosques and minarets. Pop. 26,000. The allied French and British troops were here encamped for some time in 1854. Though the harbor of Varna is exposed, a considerable trade is carried on, the value of the year's imports amounting to about £450,000, and of the exports to about £540,000.

VARNHAGEN VON ENSE, KARL AUGUST LUDWIG PHILIPP, 1785-1858; b. Düsseldorf; studied medicine at the university of Berlin, and in 1804, in conjunction with Chamisso, published a *Musen-almanach*. He then studied philosophy at Halle, Berlin, and Tübingen. In 1809 he received a commission in the Austrian army, and was wounded at the battle of Wagram. In 1813 he accepted a commission as capt. in the Russian army, and accompanied Tottenborn as adjt. on his march to Paris. He then entered the Prussian diplomatic service, and accompanied prince Hardenburg to the congress of Vienna in 1814. After the war of 1815 he was appointed resident minister at Karlsruhe, where he remained till 1819, when he retired from public affairs, and devoted himself to literature at Berlin. He published *Deutsche Erzählungen* (1815); *Vermischte Gedichte* (1816); *Gothe in der Zeugnissen der Mitlebenden* (1823); *Biographische Denkmale* (5 vols. 1824-30); and *Denkwürdigkeiten und vermischte Schriften* (7 vols. 1843-46).

VARNISH is a solution of some resinous material in any proper solvent, alcohol and oils being the ones chiefly employed. The solution must be of such consistency as to enable it to be very thinly and smoothly spread over the surface intended to be var

nished, so that when it dries, it leaves a thin resinous coating, which is either naturally glossy, or can be made so by mechanical polishing. From the extremely inflammable nature of the material employed, the preparation of varnish is extremely dangerous, and should not be attempted except in premises specially adapted for the purpose, and with skilled workmen. The resinous gums, such as copal, anime, and mastic, and the various kinds of lac, are those chiefly used; the copals and anime are employed in making the oil-varnishes, and the lacs and gum-mastic for spirit-varnishes. Heat is required with both kinds of solvents, and it is obtained by hot-water baths as a means of safety. Coloring matters are added to some varnishes, especially to those used on metal, as the lacquer varnish used to protect the polished surface of brass, which is colored with gamboge and turmeric. Saffron, aloes, dragon's-blood, and asphalt are also used to give yellow, brown, red, and black colors.

VARNISH TREE, a name given to several trees of the family *anacardiaceæ*, the resinous juice of which is used for varnishing or for lacquering. The **BLACK VARNISH TREE** (*melanorrhæa usitata*) is described in the article **MELANORRHÆA**; the **JAPAN VARNISH TREE** (*rus vernicefera*) in the article **SUMACH**. Another tree, valuable for the varnish which it yields, is *stigmarmia verniceflua*, a native of Java, Sumatra, Borneo, Celebes, and other East India islands. The juice is extremely acrid, and soon hardens into a black resin. To obtain it pieces of bamboo are inserted into the bark, and allowed to remain all night, as the juice flows more freely by night than by day. It sells at a high price. It is prepared for use by boiling it with equal parts of oil, obtained from the fruit of the *mimusops elengi*. The exhalations of the tree are said to be very noxious.

VARNUM, JAMES MITCHELL, 1749-89; b. Mass.; educated at Brown university and admitted to the bar. He entered the continental army in 1774 at the head of a Rhode Island regiment, and became a brig.gen. in 1777. The same year he had command of the American troops on the New Jersey side of the Delaware. He was at Valley Forge and at the battle of Monmouth. In 1778 he served under Lafayette. He resigned the next year. He was a member of congress, 1780-83 and 1786-87. He was appointed a justice of the supreme court of the North-west territory in 1788.

VARRO, "the most learned of the Romans," so called from his vast erudition in almost every department of literature, was b. 116 B.C., and educated first under L. Ælius Stilo Preconinus, and then under Antiochus, a philosopher of the academy. Varro served with distinction in the wars against the Mediterranean pirates and Mithridates; but afterward as legatus of Pompey in Spain, he was compelled to surrender his forces to Cæsar. He continued to share the fortunes of the Pompeian party till its defeat at Pharsalia, after which he solicited and obtained his pardon from Cæsar, by whom he was employed to collect and arrange the great library designed for the public. The next period in Varro's life was spent in literary retirement, chiefly at his villas near Cumæ and Tusculum. When the 3d triumvirate was formed, his name was enrolled in the list of the proscribed; but he succeeded in escaping, and, after some time spent in concealment, he was received under the protection of Octavian. The residue of his long life was spent in the tranquil prosecution of his favorite studies, rendered all the more arduous by the destruction of his magnificent library. He died in his 89th year, 28 B.C. Varro was not only the most learned, but also the most prolific of Roman authors. He himself confesses to having composed no fewer than 490 books; but only two of these have survived, and one of them in a fragmentary state. The most considerable of his writings, whether lost or extant, are as follows: 1. *De Re Rusticâ, Libri III.*, still extant, and though written in the author's 81st year, constituting the most important treatise on ancient agriculture known to us. 2. *De Lingvâ Latinâ*, a grammatical work, which originally extended to 24 books, only 6 of which, however, have come down to us, and even these in an imperfect form. But for this treatise, mutilated as it is, we should be ignorant of many terms and forms, as well as of much recondite information regarding the civil and religious usages of the ancient Romans. 3. *Sententia*, consisting of 165 pregnant sayings strung together, not by Varro himself, but probably by different hands at different times. 4. *Antiquitatum Libri*, comprising two sections, the *Antiquitates Rerum Humanarum*, in 25 books, and the *Antiquitates Rerum Divinarum*, in 16 books. This, the greatest work of Varro, and on which his reputation for learning was mainly founded, has unfortunately perished, all but a few fragments. From the 2d section St. Augustine drew much of his well-known work, the *City of God*. 5. *Satura*, composed in various meters, and occasionally in prose. These pieces, copied to some extent from the productions of Mænipus the Gadarene, were apparently a series of comments on a great variety of subjects, generally conveyed in the form of dialogue, and aiming at the enforcement of some moral lesson or serious truth in a familiar and even jocular style. Of these we have only fragments; and of the other works little more than the titles. The best edition of the *De Re Rusticâ* is that of Schneider (Leip. 1794-97); of the *De Lingvâ Latinâ*, that of Müller (Leip. 1833).

VARUN'A (from the Sanskrit *vr̥*, surround; hence, literally, "the surrounder," and kindred with the Greek *ouranos*) is, in the Vedic mythology of the ancient Hindus, one of the *Adityas*, or offsprings of *Akṣi*, the deity of space, and among these, one of the

most prominent. He is often invoked together with *Mitra*, sometimes together with *Agni*, the god of fire, or with *Indra* (q.v.), or other elementary deities; but frequently he is also separately praised by the poets of the Vedic hymns. The character of Varuna, as is the case with other Vedic deities, does not appear to have been or remained the same throughout the whole period represented by the Vedic poetry; but, on the contrary, to have varied according as new imaginations were connected with the idea out of which he arose. Originally, *Varuna* seems to have been conceived as the sun from the time after its setting to that of its rise; while *Mitra* probably represented the sun at its rise. The night is therefore said to be Varuna's, and the day Mitra's; and the "ever-going Varuna grants a cool place of rest to all moving creatures, on the closing of the eye (of *Savitri*, the sun)." As a consequence, the sun, as manifest during its daily course, is spoken of as his infant, and he "prepares a path for the sun;" and the dawn, which is called the golden light of Mitra and Varuna, "goes before Varuna." Out of the mysteriousness with which night is easily endowed, and the qualities which imagination may ascribe to the luminous origin of Varuna, then probably grew the moral attributes given to this deity; for he is extolled as the guardian of immortality; as the cherisher of truth; as armed with many nooses, with which he seizes evil-doers; as the forgiver of sins, and as having unlimited control over mankind. "No one rules for the twinkling of an eye apart from him, and he witnesses man's truth and falsehood. The functions of sovereign authority which are then also attributed to him are probably a consequence of his character as protector of the good, and punisher of the wicked; but his kingly might is, in some hymns, also associated with the power, predicated of him, of "setting free the water of the clouds," or of "ruling over the waters that are in heaven and earth." Whether the connection of Varuna with the element of water arose from the association of moisture with night, or, which is more likely, from the notion that water (*vr̥t*, from the same radical, *vr̥*, as Varuna) envelops or surrounds the earth, as darkness does, may be doubtful; but it is worthy of notice that the passages of the R̥gveda in which Varuna is spoken of as the cause of rain, or as the lord of rivers or the sea, are few, and perhaps do not belong to the earlier portion of R̥gveda poetry. See, for more detail, J. Muir's "Contributions to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society* for 1864. Compare also the article *Варуна*.—It is in this latter character alone, however, that Varuna appears in the classical and Purāṇic mythology; for there he has ceased to impersonate the sun, when invisible, and though, at that period too, he is still mentioned as an *Aditya*, his real quality is that of the regent of the waters, and more especially of the ocean, personified. As such, he retains, it is true, the Vedic qualities as "lord of punishment," and carries the "noose" to bind the wicked with; these attributes, however, are, then, not the reflex of his solar omniscience and power, but that of his might as the god of water.—Later fiction makes him also the regent of the west, probably in recollection of his Vedic character as the setting sun; and endows him with a wife, *Varunānti*, a son, *Pushkara*, and sometimes also with a daughter, *Punjikasthali*. It further gives him for a residence the fabulous mountain, *Pushpagiri*, "the mountain of flowers," and a marine monster, *Makara*, for his vehicle.

VARUS, **PUBLIUS QUINTILIUS**, a Roman of noble birth, was appointed governor of Syria, and on his return from that post, was sent by Augustus to command the armies of Germany. His instructions, also, were to introduce into that country the regular administration of a Roman province. The Germans were indignant at his proceedings, and under the leadership of a chief of the Cherusci, named Arminius (Latinized from Herman), attacked Varus, who, with three legions, the usual number of auxiliaries, and a strong body of cavalry, had proceeded as far as the Weser. By false intelligence, the proconsul was induced to quit his intrenched camp. The Romans marched in a long straggling line, encumbered with baggage, with their wives and children. Suddenly, they were assailed by the Germans in a forest, and it was with difficulty they forced their way to a clear space to encamp for the night. For the next two days the Romans struggled on, marching and fighting, with decreasing forces, and exhausted strength, intending to reach, if possible, the fortress of Aliso on the Lippe. Near Kreutzberg, they were met by the main force of the Germans, and completely broken. Varus killed himself in despair. Augustus, who was now old and weak, is said to have yielded to transports of grief, calling upon Varus to give him back his legions. This victory of the Germans was gained 9 A.D., and rolled back the tide of Roman conquest. The Rhine, instead of the Weser, again became the boundary of the empire. The battle has ever since been a proud recollection for the Germans, and is known by the name of *Herman-schlacht*, that is, Herman's fight.

VARUS is a term employed in surgery to designate a variety of club-foot (q.v.). The corresponding Latin word signifies "having the legs turned inward, knock-kneed." It may be regarded as the opposite to *valgus* (q.v.), and as in the case of that word, *talipes* must be understood. In the form of club-foot termed *varus*, (1) the heel is raised; (2) the inner edge of the foot is drawn upward; and (3) the anterior part of the foot is twisted inward, so that the patient walks on its outer edge.

VAS, a co. of Hungary, in the Trans-Danubian circle, bounded by Lower Austria, Styria, and Oedenburg, *Veszprém* and Zola counties; 1944 sq.m.; pop. 70, 331, 603. It is

crossed in the w. and s. by the Alps, and drained by the Raab. The soil produces grain, wine, and fruit. It takes its name from Vasvár, a free town and fortress under Matthias Corvinus. Capital, Szombathely.

VASA, a län of Finland, Russia, on the gulf of Bothnia; 16,146 sq.m.; pop. '72, 310,937. The surface is of level plains, with few lakes or rivers. Capital, Vasa.

VASARHELY, or HÓLDMEZŐ-VASARHELY, a t. of Hungary, stands on a marshy plain. 5 m. from the left bank of the Theiss, and 16 m. n.e. of Szegedin. It is considered the largest market-town of Hungary, and indeed of Austria. Pop. '69, 49,153, actively engaged in cattle-breeding, and in the cultivation of wine and tobacco.

VASARHELY, or MAROS-VASARHELY, a handsome t. of Transylvania, the largest of what are called the Szekler towns, and the center of Szekler political life, stands on the Maros, on a fruitful plain 60 m. n.n.e. of Hermanstadt. It has broad streets and well-built houses; excellent public schools, Protestant and Catholic—the latter richly endowed; a strong castle; and a choice public library founded by count Tekeli, and embracing 60,000 vols., among which are MS. Tacitus, from the library of King Matthew Corvinus. Tobacco, wine, and fruit are largely cultivated. Pop. '69, 12,678. —*Transylvaniæ*, by Charles Boner (Lond. 1865).

VASARI, GIORGIO, an Italian painter and author, was b. at Arezzo, in Tuscany, in 1512. He was a pupil of Michael Angelo's, and obtained the patronage of many distinguished persons, as cardinal Ippolito de' Medici, Clement VII., and the dukes Alessandro and Cosmo de' Medici; but his pictures possess no peculiar or distinctive merit, and his reputation rests exclusively on his *Vite de' più eccellenti Pittori, Scultori, e Architetti* (Lives of the most excellent Painters, Sculptors, and Architects; Flor. 2 vols. 1550; 2d ed. by Vasari himself, 3 vols. 1568). This work is written, on the whole, in a simple and honest style; at times, it is even marked by a noble eloquence. The criticism is often admirable; and in spite of frequent inaccuracies (which, indeed, have been corrected by Della Valle, Rumohr, Förster, and others), it remains a model of art criticism and biography. Vasari died at Florence in 1574.—Bohn has published an English translation of Vasari, in 5 vols., forming part of the "Standard Library" series.

VASCO DA GAMA. See GAMA.

VASCULARES, in De Candolle's botanical system, the first of the two great divisions of plants, consisting of those in which vascular tissue (q.v.) appears, and thus including all the phanerogamous plants, both endogenous and exogenous. See CELLULARS.

VASCULAR TISSUE, in botany, that kind of vegetable tissue which is composed of closed tubes or vessels, elongated cells. The tubes have membranous walls of cellulose (q.v.), and within them are juices of the plant, which often deposit secretions. They are generally almost cylindrical—although sometimes prismatical from compression—except that they taper to a point at each extremity, preserving their character as cells by being closed at the extremities. They lie close together in bundles, and often overlie one another at the ends. The principal kinds of vascular tissue are woody fiber (q.v.) and laticiferous tissue, composed of the vessels which convey the latex (q.v.). Laticiferous tissue is generally composed of branched and anastomosing tubes, the walls of which are thin and delicate, extremely so in young plants. Many varieties of vascular tissue have, however, been distinguished by botanists, of which the most important are those classed under the name of *fibro-vascular tissue*, having spiral fibers in the tubes, winding up the inside of their walls as if to strengthen them. These fibers are elastic, and the coil can often be easily unrolled, at least while the tubes are young. Many fibers are often found in a single tube.

VASE (Lat. *vas*, Ger. *fass*), a term applied, in its widest signification, to all vessels adapted either for ornament or use. It is generally used in this sense with reference to ancient art; in connection with modern art, it is restricted to vessels of an ornamental kind. Few remains of antiquity have excited more interest than vases, particularly those of Greece, and of the Greek colonies and conquests. The names given by classical writers to vessels adapted for different purposes, have not always been easily identified with the ancient vases which have been preserved to us; but according to the nomenclature of M. Gerhard, which has generally been adopted, the following are the principal varieties, classified according to their uses: 1. Vases for holding wine, oil, or water, known under the names of *amphora* and *diota stamnos*. 2. Vases for carrying water, *hydria*, *calpis*. 3. Vases for mixing wine and water, *crater*, *kelce*, *oxybaphon*. 4. Vases for pouring, *oinochoë*, *olpe*, *prochoüs*. 5. Drinking cups or goblets, *cantharus*, *kyathus*, *karchesion*, *holchion*, *kyphos*, *kylix*, *lepaste*, *phiale*, *keras*, *rhyton*. 6. Vases for ointments or perfumes, *lekythos*, *alabastron*, *askos*, *bomyllos*, *aryballos*, *kotyliskos*.

The materials of which vases are formed include metal, stone, glass, and earthenware.

Vases of the precious metals were in use among the ancient Egyptians. Among the Greeks and Greek colonists of Asia Minor, they were very early employed for sacrificial purposes, and those of silver were frequently chased, an art in which considerable progress had been attained at a remote period. The general improvement in design in the epoch of Phidias, told in the chaser's art, the complete development of which was, however, according to Pliny, due to Polykletus. In the latter period of the Roman republic, chased silver vases were more than ever in request; but under the empire,

chasing fell into disuse. Bronze, iron, and lead were all used as materials for vases. Bronze vases abounded among the presents made to the Greek temples: they were generally thin and hammered out, often decorated with inlaid ornaments or reliefs, among which mythological subjects and animal heads appear, and the handle sometimes assumed the shape of the human figure. Lead vases were chiefly used for unguents or perfumes. The gold and silver vases of the first few centuries of the Christian era were, for the most part, imitations of pagan art. In the 12th c., a style was introduced, called *damascone* work, with patterns of gold or silver wire imbedded in iron or bronze. Many vases of this kind were made by Benvenuto Cellini.

Among the mineral materials which, plain and enriched, have been used both in ancient and modern times for vases, are marble, lapis lazuli, jasper; semi-transparent stones, such as opal, girasol, agate, chalcedony, sardonyx, cornelian; as also transparent gems and rock crystal. Multitudes of vases of precious stones were brought to Rome from the conquered provinces, particularly from Asia. Those in highest esteem were the *myrrhine* vases, whose material has been the subject of dispute among antiquaries; they are described by Pliny as brilliant, gem-like, and of various colors, generally purple and white, mingled with the iridescent hues of the rainbow. Precious stones have not ceased to be a material for vases; large and costly vases of malachite and jasper are manufactured in Russia; and elaborately carved vases are still made of the white alabaster of Volterra, in Tuscany.

Glass has at all times been a favorite material for vases. Small toilet-phials of opaque glass were in use in Egypt as far back as 1450 B.C. The cameo vases of Rome, of which the Portland vase is the most celebrated example, were composed of two layers of glass, the outer of which, being opaque, was cut down into groups of figures, delicately executed in relief. About the 3d c., we have, for the first time, the *diatreta*, or bored vases, with an external veil or network, almost detached from the rest of the glass. In the 5th c. occur vases composed of two layers of glass, with gilded subjects—often figures of Christ and legends of saints—between them. Vases of green glass, of a later period, with undercut projections, bearing a rude resemblance to the diatreta, have been found in tombs in England and France. Venice afterward acquired great celebrity for its glass vases. In the beginning of the 16th c., the Venetian glass-makers introduced a class of vases enriched with white or colored filigree work, having the appearance of being incrustated in the glass. They were much sought after all over Europe; and great care was taken to prevent the secret of their manufacture from being discovered. Beautifully enameled vases were also issued from the Venetian manufactories, as well as others of grotesque forms, representing imaginary animals, and pierced with holes or constructed in the form of a siphon, which are said to have been employed by alchemists, and in pharmacy and distillation. The German manufacturers, in the 16th c., produced vases with heraldic designs and inscriptions in enamel, generally cylindrical, and sometimes of considerable size, which are much prized by connoisseurs; in the following century, the designs became more artistic; and both in Germany and Italy, it was quite usual for distinguished artists to be employed to decorate these glass vases, in imitation of rock crystal, with ornaments, arabesques, and engraved subjects.

The most prevalent material for vases of all kinds, including those intended to hold the ashes of the dead, has generally been baked clay. Multitudes of Greek sepulchral vases have, after a lapse of more than fifteen centuries, been brought to light, at a time when learned men can appreciate them, and gather from them valuable information in history and archaeology. An account of the terra cotta vases of Greece, Italy, and other countries is given under POTTERY.

VASISHT'HA (the superlative of the Sanskrit *vasumat*, wealthy) is the name of one of the most celebrated Vedic Rishis (q.v.), the author of several hymns of the Rîgveda, and a personage who seems to have played an important part in the early history of the Brâhmanic or priestly caste of the Hindus. In the account given of him, historical events and mythological fictions are so much blended together that it is scarcely possible to gather more from it, for certain, than that he was a sage of high reputation, and a priest jealous of the privileges and the position of his caste, and ever ready to assert its superiority over the second or military and royal caste. In one of his Rîgveda hymns he claims to have been enlightened by the god Varunâ; and in another he is called the son of *Mitra* and *Varunâ* (q.v.), born from the mind of *Urasî* (q.v.). In other Vedic passages his pre-eminence over other Rishis, and his acquaintance with sacred and sacrificial knowledge are extolled. In the *Mahâbhârata* (q.v.), which also calls him the son of *Mitra* and *Varunâ*—whence his appellation there, *Maitrâvarunî*—he is mentioned as imparting divine knowledge to King Janaka, and as the family priest of the race of Ikshvâku; and in the *Purânas* he is said to have been one of the arrangers of the Vedas in the Dvâpara age. In *Manu* and the *Purânas* (q.v.), he becomes a patriarch, one of the nine mind-born sons of the god Brâhman; and, according to some, marries *Uṛjâ* (strength); according to others, *Arundhati*, one of the Pleiades, by whom he has seven sons. Various other legends relating to him always endeavor to impress the Hindu mind with his Brâhmanic power over kings and Kshattriyas generally. Thus, so great was his power, as the *Râghavansâ* relates, that when king Dilîpa was doomed to remain childless, because he had inadvertently

offended the fabulous cow Surabhi, he was released of this curse by faithfully attending on the cow of Vasisht'ha, which was the cow of plenty, and an offspring of Surabhi. But the most interesting episode of his life is that relating to his conflict with *Vishvadmitra* (q. v.). A Vasisht'ha is also mentioned as the author of a law-book; but whether he is, or is intended to be, the same personage as the ancient sage, may be doubtful. The name is often written *Vas'isht'ha*, when it would be the superlative of *Vas'a*, meaning "the most humble"—which the epic and Purānic Vasisht'ha certainly was not—or of *Vas'in*, meaning "the sage who has thoroughly subdued his passions"—which, too, would seem to be a rather strange epithet of the irascible saint. But though the name of the owner of the cow of plenty, who could obtain anything he desired, is doubtless correctly spelled Vasisht'ha, the less correct spelling must nevertheless have been current for a considerable time, since so early a poet as Kālidāsa (q. v.), in his *Raghuvans'a*, puns on the words *vas'i vas'isht'ha*, "Vasisht'ha, the sage with subdued passions."—See, for the legends concerning Vasisht'ha, J. Muir's *Original Sanskrit Texts*, vol. i. (1858).

VASQUEZ DE CORONA'DO, FRANCISCO, 1505-42; b. Spain; came to New Mexico, which he explored. In the hope of finding treasures among the Indians, he headed an expedition which started from Culiacan on the Pacific, early in 1540, traversed Sonora, crossed the Gila, and came to the cities of Cibola. He did not, however, find the expected treasure. He sent to Spain drawings of these cities, and an account of his expedition, which contains the first description of the buffalo. On his journey back from the city of Quivera he fell off his horse and was killed.

VASSAL (Celtic, *gwás*, a youth or page), in the feudal system, is the correlative of suzerain (q. v.). See also SUPERIOR, FEU.

VASSAR, MATTHEW, 1792-1868; b. England; emigrated to this country in 1796. He succeeded his father in the brewing business near Poughkeepsie, and acquired a great fortune, \$800,000 of which he gave for the establishment and endowment of the college for women which bears his name.

VASSAR COLLEGE, at Poughkeepsie, N. Y., founded by Matthew Vassar in 1861 for the advanced education of young ladies. It was not organized, however, until 1865. Mr. Vassar was a Baptist, and thus far the president of the college has been of that denomination, but its management and course of instruction are not sectarian. It has an endowment of \$287,000, and an annual income of \$146,000. The buildings of the institution, which are finely situated upon an eminence 2 m. e. of the city of Poughkeepsie, consist of one main college edifice of brick, 5 stories high, 500 ft. in length by 200 in breadth at the center, and 164 ft. at the transverse wings; an astronomical observatory, an art museum, and a chemical laboratory. These together are valued at over \$516,000. The large building contains dormitories for students, residences for officers, a chapel, library, reading-room, recitation and lecture rooms, etc. The apparatus in the laboratories is valued at over \$40,000. The cabinets of natural history and geology are valued at \$30,000. The library contains 12,000 volumes, valued at \$15,000. The gallery of art and library of art are valued at \$31,000. The college holds high rank, and has done most valuable educational work. The college embraces, besides the usual classical course, schools of painting and music. There is also a preparatory course. Number of professors (1880), 10; other instructors, 17; students, 306; alumni, 449. President, S. L. Caldwell, D.D.

VASSILKOV', a t. of Little Russia, in the government of Kiev, and 18 m. s.w. of the city of that name. This town, which was founded in the 10th c., contains 10 factories, 5 of which are employed in the manufacture of tobacco. Pop. '67, 16,076.

VAS'TO, or IL VASTO, a t. on the e. coast of southern Italy, in the province of Chieti, 26 m. s.e. of Ortona. It stands on a rising ground facing the Adriatic, from which it is distant $1\frac{1}{2}$ m., is inclosed by walls, contains a spacious square with a handsome fountain, a handsome palace, a castle, and several churches. It carries on an active trade in corn, oil, and vinegar. Pop. 12,000.

VASUDEVA AND VASUDEVA. See under VISHN'U.

VATER, JOHANN SEVERIN, 1771-1826; b. Saxe-Altenburg, Germany; educated at Jena and Halle. He became a distinguished linguist, orientalist, and theologian; and held professorships at Jena, 1796; Halle, 1800-9 and 1820-26; and Königsberg, 1809-20. He published important works, of which the best known are his Russian, Polish, and Hebrew grammars, and the *Literatur der Grammatiken, Lexika und Wörtersammlungen aller Sprachen der Erde*.

VATERIA. See TALLOW TREE.

VATICAN, PALACE OF, in Rome, the principal residence of the pope, and the seat of the great library and the museums, and collections of art, ancient and modern, which, for visitors, constitute one of the chief attractions of the city of Rome. The popes, very soon after the establishment of the peace of the church under the emperor Constantine, had a residence at the Vatican, which they occupied, although at uncertain intervals, conjointly with that of the Lateran. For a long time, however, through the mediæval, and especially the late mediæval period, the Vatican appears to have been

neglected. It was Nicholas V. who began that systematic scheme for the improvement and embellishment of the Vatican which has resulted in what, taken altogether, may be regarded as perhaps the noblest of princely residences. Alexander VI., Julius II., and above all, Leo X., pursued the same plan; and there are very few of the succeeding popes who have not had a share in the enlargement or embellishment of the Vatican. Amid all the difficulties, financial and political, of his pontificate, Pius IX. carried out many tasteful works of completion or restoration, the most striking and effective of which is the great stair by which it is approached from the colonnade of St. Peter's. The building, with its gardens and other appurtenances, is said to cover a space equal to the whole area of the city of Turin, such as it was thirty years ago, with a pop. of 130,000. It is popularly believed to contain 16,900 apartments of various sizes, but this is probably an exaggeration. Some of them, however, are of unrivaled beauty, among which may be particularized the chapel of San Lorenzo, the Pauline chapel, and the still more celebrated Sixtine chapel, which is decorated in frescoes from the pencil of Michael Angelo; the Sala Regia, the galleries and halls decorated by Raphael, Giulio Romano, and their scholars; the magnificent library, which, although surpassed in the number of volumes, is unrivaled among the cities of Europe in extent, in beauty of proportions, and in decorations, the galleries of antiquities, Christian and pagan, and of paintings, statuary, bronzes, medals, vases, and other objects of art. Many descriptions of the Vatican, with costly illustrations, have been published, and are to be found in all great libraries. An extremely interesting account, historical and descriptive, is to be found in Donovan's *Rome, Ancient and Modern*; see also Hare's *Walks in Rome*, and for recent additions and changes, Murray's *Handbook of Rome*.

VATICAN CODEX, one of the most valuable manuscripts of the Greek Scriptures, in uncial letters, belonging to the 4th century. Its marks of antiquity are the same as those of the Sinaitic codex, and the characters in both are very much alike. It is written on fine, thin vellum in beautiful square letters. It contains a large part of the Old Testament, and the New as far as Hebrews ix, 14. It has been in the Vatican library about three centuries. An edition prepared by cardinal Mai was published in 1857, after his death, but was found to be very erroneous. A new edition is now in progress under papal authority in beautiful style. The size and shape of the manuscript are preserved; and the printing is from the type cast for the imperial Russian edition of the Sinaitic codex.

VATICAN, COUNCIL OF THE (COUNCIL, *ante*). In 1867, more than 300 years after the council of Trent, pope Pius IX. announced his purpose of holding another, the 20th ecumenical council. The period between this announcement and the publication of the pope's encyclical (June 29, 1868), definitely summoning the council, was replete with controversy regarding it, nor did the controversy become mute till the very date of the meeting. The liberal parties in the church, specifically the Jansenist, Gallican, and Old Catholic parties, as opposed to the Jesuitical and Ultramontane section—who were opposed to the subordination of the state to the church and of councils to the pope, vigorously contested the expediency of holding a council. Many of the prelates and of the general body of the clergy, especially of France, Belgium, Germany, and Holland, as well as many Catholic statesmen, gave voice to their opposition. Notably the court of Bavaria, under the inspiration of Dr. Döllinger, the leader of the Old Catholic party, combated the proposition in a vigorous circular addressed to Roman Catholic courts, showing the political bearings of the question. Austria united in discountenancing the projected meeting, and although Napoleon III. was not indisposed to it within certain limits, his ministry generally regarded it with distrust. Montalembert from his dying bed issued a voice of warning in opposition. The government of Italy opposed it openly. On the festival of the Immaculate conception, 1869, amid thunders of artillery from San Angelo, and universal ringing of church bells the council held its first session in the basilica of the Vatican. There were present 719 prelates, 49 of whom were cardinals, 9 patriarchs, 4 primates, 121 archbishops, 479 bishops, and 57 abbots and generals of monastic orders. This number gradually rose to 764, which was the greatest number of the 1,031 members invited who attended any one session. The deliberative sittings of the council, whether of the committees, or deputationary, or of the general congregation, were strictly private, but four public sessions, were held at different times, when the decrees of the council were solemnly promulgated.

The subjects for discussion had been distributed by preparatory commissions under four heads (faith, discipline, religious orders, rites, including missions), each assigned to a separate committee of 26 members presided over by a cardinal; the reports of these committees on each specific point being laid before the general congregation, discussed, revised, adopted, and then, in public session and in presence and by authority of the pope, proclaimed to the public. Although the doctrine of infallibility had not been formally announced as a portion of the programme of the council till its actual convention, yet it may be said that the council had but two real objects. The solemn ratification of this dogma, and the utterance of a protest against infidelity in all its aspects, whether of rationalism, pantheism, materialism, or atheism. While the decrees setting forth the doctrines of the church regarding God, the creation, the relation of faith to reason, etc., were unanimously adopted in the third public session, April 24,

1870, the decision in regard to infallibility was not arrived at so harmoniously, and not till a much later period.

It had been arranged that the committee on faith should consider all other matters lying within its sphere, relating to the church, before treating of its head and his prerogatives; but, April 29, the Italian bishops addressed a collective note to the council urging that all questions should give way to that of papal infallibility. The pope approved of this change, and ordered an inversion of the order of business accordingly. The debates on the subject agitated the council for some months, and the first vote was not arrived at till July 11, when, out of a court of 601 members, 88 voted "*non placet*," or adversely. Influences were brought to bear on the non-conforming members, and these, combined with the threatened outbreak of the Franco-Prussian war, led many either to return to their dioceses, or, at least, to refrain from further attendance on meetings at which a vote was taken. On the final vote on the question, July 18, 1870, only two anti-infallible prelates recorded their votes; and even these, with all the rest of their recalcitrant brethren, did ultimately, for the sake of unity and peace, acquiesce in the decrees of the church.

The decision on this matter arrived at by this great council may be summarized as follows: "The pope is superior to all councils; he is bishop of bishops, they being his vicars as he is vicar of Christ; when speaking on questions of faith and morals he is infallible, and his decisions irrefragable and irreversible." A decision of such historic significance and so far-reaching in its consequences has not been issued by any former council: by it the Jesuits and Ultramontanes have gained a triumph absolute and decisive over their liberal opponents; but the ultimate fruits of such a victory can be developed only with the process of the ages. In the mean time it may be noted that it has placed the church and the government of Germany in direct antagonism, and one of the first results of the victory of the Jesuits was to procure their own expulsion from that country. The council was adjourned and indefinitely postponed, Oct. 20, 1870, in consequence of the outbreak of the Franco-Prussian war; and, from the fact that the pope combines in his own person qualities and functions setting him above, and rendering him independent of all councils, there seems no good reason why another should ever be summoned.

VATTEL, EMERICH, a well-known writer on the law of nations, was born at Couret, in Neuchâtel, Aug. 25, 1714. His father, a Protestant clergyman, had been ennobled by the king of Prussia, whose subject he was. Vattel studied for the church at Bâle and Geneva, but he devoted greater attention to the writings of Leibnitz and Wolf than to those of the Calvinistic divines; and instead of becoming a country clergyman, he resolved to push his fortune at the court of Berlin, as a man of letters and diplomatist. In 1741 he offered his services to Frederick II., who had just ascended the throne, but there was then no vacancy in the public service. Three years afterward, he received an appointment at Dresden from the elector of Saxony, then also king of Poland; and in 1746 he was sent by him as minister to Bern. In this post, he had ample leisure, and devoted himself to literary pursuits. He published, in French, under different titles, collections of essays on miscellaneous subjects, which are lively, and well written. But his chief attention for ten years was bestowed on his great work, the *Droit des Gens; ou Principes de la Loi Naturelle appliqués à la Conduite et aux Affaires des Nations et des Souverains*. This title sufficiently explains the scope of the work. It contained little that was new, but it abridged and systematized the doctrines of Grotius, Puffendorf, and Wolf. Vattel had, however, that skill in arranging his materials, and that power of lucid expression, which so often characterize French men of letters; and his book became rapidly popular as a text-book of international law. Like all his predecessors in the same field, Vattel based his whole system on an imaginary law of nature, and it would be easy to enumerate a large number of false conclusions to which he came in the absence of the light thrown on the law of nations by practice, and by the principle of utility in our time, so generally adopted as the test of international morality. After the completion of his great work, Vattel was recalled to Dresden, where he married, in 1764, Marianne de Chêne, and was promoted to the rank of privy-councilor. The duties of his new post proved too arduous, and he died of over-work on Dec. 28, 1767. Mr. Chitty republished, in 1833, an English translation of Vattel, with notes.

VAUCANSON, JACQUES DE, 1709-82, b. France; studied mathematics, and produced several curious mechanical inventions. Among them were a flute-playing automaton, and a duck that swam, quacked, etc., and could apparently digest its food. In 1741 he was made inspector of silk factories, and while in that position invented useful machines for dressing and weaving silk.

VAUBAN, SEBASTIEN LE PRESTRE, Marshal of France, the celebrated military engineer, was born at Saint Leger de Fougere, in the dep. of Nièvre, May 15, 1633; and being left an almost destitute orphan at the age of ten, his education was carried on under the auspices of the *curé* of his village. Leaving Saint Leger in 1651, he set out on foot to join Condé's army, then on the Belgian frontier; and during two years of active field service, obtained large insight into the engineering methods then in practice. Taken prisoner in 1653, he joined the royalists, and during the succeeding contest was mostly attached to the army of Turenne, who intrusted him with the sole control of the

besieging operations; and the powerful assistance which the extraordinarily rapid reduction of the enemy's strongholds gave to the king's little army, gained for Vauban the repute of being the most promising young engineer of the time. On the conclusion of peace in 1660, he was dispatched to the w. to demolish the rebel strongholds in Lorraine, and to take charge of Breisach; but in 1667 he appeared again in the n., capturing one after another the powerful defenses of the Belgian frontier. About this period, the all-powerful Louvois, charmed by Vauban's probity, punctuality, and habits of cool calculation, no less than by his genius, took him firmly by the hand; and it was as much owing to the great minister's favor as to the superiority of his designs that Vauban was preferred to the highly honorable and important office of fortifying the Flemish fortresses which had fallen into the possession of France. This labor accomplished in 1672, and the war with Holland resumed, Vauban took his old place as director of the siege operations, and for the first time introduced into practice in western Europe the method of approach by parallels (recently borrowed from the Turks), at the siege of Maastricht (1673), and with such effect, that that strong fortress capitulated in thirteen days. After tracing the plan of siege for Treves, and with remarkable sagacity foretelling the date when it *must* fall, he set himself with energy to strengthen the newly-acquired fortresses in the low countries, and closed a long and brilliant array of services for 1674 by throwing himself into Oudenarde, where William of Orange besieged him in vain. In 1675 he inaugurated a new era in military tactics by obtaining the creation of a corps of engineers, though the completion of the innovation by the establishment of companies of sappers was denied him. In 1676, he conducted the remarkable sieges of Valenciennes and Cambrai, stormed the latter in open day, against the unanimous opinion of the generals of the army; and two years later was rewarded for his long and glorious services by the appointment of director-general of fortifications. This post gave him the supreme control of the department of military engineering, and the ten years of peace which followed 1678 supplied opportunity for Vauban's rendering to France perhaps the greatest of his services, in surrounding the kingdom with a complete cordon of fortresses, fitted either for defense or for commanding weak points of the neighboring countries. At intervals during this period, he captured the almost impregnable fortress of Luxembourg, and planned and partly executed the magnificent aqueduct of Maintenon, by which the waters of the Eure are conveyed to Versailles.

War breaking out again in 1688, Vauban conducted the sieges of Philipsburg, Mannheim, and Frankenthal (introducing, at the last, his invention of ricochet-firing) Mons, (1691), and Namur (1692), with his usual success, though opposed at the last-named place by his great rival, Cohorn, who had fortified, and who defended it. After this period, Vauban almost disappears from the field of warfare, on which he had stood invincible for so many years, for the sieges of Charleroi (1693), Ath (1697), Breisach (1704), and the construction of the intrenched camp near Dunkirk (1706), are the only professional works of importance during the last 14 years of his life. After the peace of Ryswick in 1697, he had applied his active practical mind to the consideration of various deficiencies and anomalies in the internal government of France; and his zeal and research brought together a large mass of information and suggestion on numerous subjects, which was published under the curious title of *Œisirétés de M. de Vauban*, and contained recommendations for the collection of statistics of population, commerce, and agriculture, for supplying the army by recruitment, and valuable suggestions for improving the soil by drainage, etc., etc. Another of his works which excited an immense sensation at the time was the *Dîme Royale* (1707, in which he discussed the question of taxation, and anticipated in the most striking manner the doctrines which, a century later, overthrew the French monarchy: such principles promulgated by a man of Vauban's sterling integrity and profound practical wisdom, could not be expected to be very palatable to the king and court of whose conduct they furnished indirectly the severest censure; and we are not therefore surprised to learn from Saint-Simon "that the marshal de Vauban was very ill received when he presented himself," and that, by an edict of Feb. 14, 1707, his book was seized and confiscated. Vauban did not long survive his disgrace, dying at Paris, Mar. 30, 1707. Fontenelle calculates that he had constructed 33 new fortresses, repaired 300 old ones, conducted 53 sieges, and had been present at 140 "actions of vigor;" and in his practice, the capture of a fortress was certainly a mere question of time and powder. His various professional works on the attack and defense of places, and on mines, have been collected under the title of *Œuvres Militaires* (Paris, 1796); and besides these we have various other memoirs on professional subjects from his pen. Historical notices and eulogies of Vauban are abundant in French literature. See *Nouvelle Biographie Générale*.

VAUCLUSE, a department in the s.e. of France, bounded on the w. by the Rhone, and on the s. by the Durance, which separates it from the department of Bouches du Rhone. Area, 1365 sq.m.; pop. 76,255,703. The Rhone is the great river and its affluents, with the exception of the Durance, are all small. The department is traversed in the e. by spurs of the Alps. The plains are all in the w.—the chief being those of Orange, Carpentras, and Cavaillon. In the e., the mountains are separated by narrow, torrent-plowed valleys; and the summits, the chief of which is Mont Ventoux, 6,778 ft high, are arid and bare. The climate is healthy and temperate, although sub-

ject to great variations—the winds from the n. and n.e. being sometimes very violent. The department, though more agricultural than manufacturing, does not produce cereals in great quantity; but the peach, pear, prune, almond, and fig trees bear excellent fruits. Olive, mulberry, and orange trees are quite common. Wines and honey, both held in high esteem, are produced. There are four arrondissements—Avignon, Apt, Carpentras, and Orange. Avignon is capital.

VAUD (Ger. *Waadt*), a canton which forms the western corner of Switzerland between the Jura and the Bernese Alps. Area, 1240 sq.m.; pop. '76, 242,439. It is a comparatively level district, traversed, however, by an elevated tract known as mount Jorat, from which plains slope on either side to the lake of Geneva on the s., and the lake of Neuchâtel on the north. On both sides, near the mountains, there are extensive pasture-lands, but the greater part of the country is highly cultivated. The orchards and vineyards are very extensive, the latter yielding white wines of excellent quality. There are no manufactures of any importance. It is now traversed by railways, which connect it in two directions with France, and in three with the rest of Switzerland. It forms part of French Switzerland, the dialect spoken being the Vaudois. The religion is Protestant. Vaud has formed, since 1830, a democratic republic, the council of the canton being elected and controlled by the people. In 1845 and 1861 the rights of the people were still further extended. Vaud, after the fall of the Roman empire, formed part of the Burgundian kingdom. In the 13th c. it became a dependency of Savoy, to which it was annexed in 1359. In 1476 the house of Savoy took part with the duke of Burgundy in his struggle with the Swiss; and on his defeat, a part of Vaud was annexed to the adjoining cantons. In 1536 the Bernese took possession of the whole of Vaud, which they divided into 15 parts, administered by *baillis*, appointed at Bern. The nobility became patricians of Bern, and in this way acquired great influence. Still, the local councils had the power of appointing magistrates and administrative officers, which, to some extent, tempered the aristocratic character of the government. The French invasion put an end to the rule of Bern, and Vaud became a separate canton. The government remained in the hands of the higher classes until June, 1830, when a new constitution, granting a vote to every adult *bourgeois* of good character, was obtained from the council. The existing democratic-representative constitution dates from 1845. The Vaudois are industrious and well educated: and from this part of Switzerland come a large number of the Swiss teachers and governesses who are met with in all parts of the world. Capital, Lausanne (q.v.).

VAUDEVILLE, originally a popular song with words relating to some story of the day; whence it has come to signify a play in which dialogue is interspersed with songs of this description, incidentally introduced but forming an important part of the drama. The German *liedertafel* is a somewhat similar composition. The name vaudeville is a corruption of Vaux de Vire, the name of two picturesque valleys in the Bocage of Normandy. One Olivier Basselin, a fuller in Vire (q.v.), composed about the middle of the 15th c. a number of humorous and more or less satirical drinking-songs, which were very popular, and spread over France, bearing the name of their native place (Les Vaux de Vire). As the origin of the term was soon lost sight of, it at last took its present form. In the 16th c., Vanquelin still names such pieces Les Vaux de Vire.

VAUDOIS. See WALDENSES.

VAUDREUIL, a co. in s.w. Quebec, having the St. Lawrence river and the island of Perrol on the s.e., and the lake of Two Mountains on the n.; 182 sq.m.; pop. '71, 11,003. Capital, Vaudrenil.

VAUDREUIL, LOUIS PHILIPPE, DE RIGAUD, Marquis de, 1724-1802; b. France; entered the navy. He was in command of a vessel in the fight between Byron and D'Estaing near Granada in 1779, and that with Rodney near Martinique in 1780. He was in command of a squadron in the action between De Grasse and Graves, and in that with Rodney in 1782. He sat in the states general in 1789. He escaped to England, where he remained during the reign of terror.

VAUDREUIL, PHILIPPE DE RIGAUD, Marquis de, 1641-1725; b. France, of ancient family. He entered the army, and in 1687 was sent to Canada, then ranking as brig. gen.; he led expeditions against the Senecas, Oneidas, and other Indians in general with success. In 1698 he became governor of Montreal, and in 1703 governor-general of Canada. In this position he showed great executive ability, and defeated a naval expedition sent against Quebec.

VAUDREUIL, PIERRE DE RIGAUD, Marquis de, 1698-1764; b. Quebec, Canada; son of Philippe. He entered the French army, and in 1733 was appointed governor of the Trois Rivières. He became governor of Louisiana in 1742, succeeded to the title in 1748, and was made governor general of Canada in 1755. He vigorously resisted the attempts of Wolfe to capture Quebec; but, receiving no assistance from France, was forced to surrender. An official examination in France vindicated his conduct.

VAUGHAN, BENJAMIN, LL.D., 1751-1839; b. Jamaica; educated at Cambridge university, England; studied both law and medicine. He was a member of parliament, 1792-96. Dr. Vaughan wrote the *The Rural Socrates*, and translated Poivre's *Travels of*

a Philosopher. He emigrated to this country, and accumulated a fine library, a large part of which he gave to Bowdoin college, near which he lived for the last 29 years of his life.

VAUGHAN, CHARLES JOHN, D.D.; b. England, 1816; studied at Rugby school under Dr. Arnold; graduated Cambridge, 1838; fellow of Trinity, 1839; ordained in the church of England; had the living of St. Martin's, Leicester, 1841-44; head-master of Harrow school, 1844-59; vicar of Doncaster, 1861-69; chancellor of York cathedral, and chaplain in ordinary to the queen. He is one of the leaders of the "broad church," and distinguished as a preacher and commentator. He has published many volumes of sermons and expositions.

VAUGHAN, HENRY, 1621-95; b. South Wales; entered Jesus college, Oxford, 1638; became a student at law at the Inns of Court, and studied medicine in London, withdrawing subsequently to his native place, Newton, in South Wales, where he became an eminent physician; also cultivating his favorite studies, and writing poetry on various subjects, chiefly devotional. The ancient inhabitants of South Wales were called "the Silures," and coming from that region, he adopted the name of "the Silurist," a name since received into the nomenclature of modern geology. Among his works which have been republished in our own day are *Poems with the tenth Satire of Juvenal Englished* (1646); *Olor Iscanus* (1651); *The Mount of Olives, or Solitary Devotions* (1652); *Thalia Rediviva* (1673).

VAUGHAN, ROBERT, D.D., b. England, 1798; educated for the ministry at Bristol college; minister of Independent chapel, Kensington; professor of history in London university, 1830-42; president of the Independent college at Manchester, and professor of theology, 1842-57; the projector of the *British Quarterly* and its editor, 1845-65. His chief works are: *Life and Opinions of John de Wycliffe, D.D.*; *Memorials of the Stuart Dynasty*; *Causes of the Corruption of Christianity*; *The Protectorate of Oliver Cromwell*; *History of England under the House of Stuart*; *History of Revolutions in England*; *Memorial of English Nonconformity*.

VAUGHAN, WILLIAM, 1703-46; b. N. H.; graduated at Harvard, 1722. He was largely interested in the Newfoundland fisheries; took part in the Louisburg expedition of 1745, acting as lieut.col. of militia. Feeling slighted in the distribution of rewards, he went to England to present his claims, and there died.

VAULT, an arched roof, usually constructed of stone or brick-work. The simplest kind of vault is the plain wagon or tunnel vault, being a simple segmental or semicircular arch, thrown across a longitudinal apartment, and extending from one end to the other. Ordinary bridges show an example of this style of vaulting. Such vaults were commonly used by the Romans, who also built vaults with *groins*—i.e., vaults intersecting one another. See **GROINED VAULTING**. The tunnel arch, of a pointed form, was of very ancient introduction, having been used by the Assyrians for vaulting their large drains.

The Egyptians are also said to have been acquainted with vaulting; but the earliest remains of ancient vaults of any magnitude are Roman works.

The Roman vaults, where groined, are usually constructed with carefully cut stone, so as to prevent the angle from chipping. The mediæval architects had not the costly materials or skill of the Romans at command, so they formed the groins only of dressed stone, and the filling in of the vault with commoner materials. This led to the groin becoming a prominent feature in mediæval architecture, being generally ornamented with moldings and carved work. We have already traced the progress of Gothic vaulting under the heads **GOthic ARCHITECTURE**, **FAN-TRACERY VAULTING**, **RIB**, etc. Domical or hemi-spherical vaulting was also much used by the Romans. The Pantheon, in Rome, is the finest example remaining, being a circular building with a dome 142 ft. in diameter. Roman domes and vaults are frequently ornamented with sunk panels. During the renaissance period vaulting in great measure gave place to wooden roofs; but when employed, the domical or plain groined vaults of Roman architecture are chiefly used. In modern works vaults and arches are gradually becoming superseded by the use of iron construction, both for roofs and for supporting floors, bridges, etc.

VAUTIER, BENJAMIN, b. Geneva, 1830; studied art in Düsseldorf, 1850-51; became distinguished for his *genre* pictures of life in Switzerland and Swabia. Previous to 1864 he exhibited "Devout Singers in a Church;" "A Party embarking on a Rhine Steamer," etc. "Cats in a Criminal Case" is considered one of his best productions. At the Paris exhibition of 1867, where he exhibited his "Courtier and Peasants in Wurtemberg," he received a medal. Among his latest works are "A Public Dinner," and "A Village Funeral," 1871. He has illustrated an episode of Immermann's *Münchhausen*.

VAULTING-SHAFT, a small column, or pillar, supporting the ribs of a Gothic vault. These shafts generally occur in clusters, and may either spring from the ground, or be supported on small corbels in the wall.

VAUMURE, in old fortresses, a low work under the wall in the nature of a *fausse-braye*.

VAUQUELIN, JEAN, a French poet, was b. in 1535, of a noble family at the château of La Fresnaye, near Falaise. He made a pretense of studying law at Poitiers, Paris, and at Bourges, but really spent his time in gayety and verse-making. He finally became president of the *présidial* bench at Caen, where he died in 1607. His *Œuvres Poétiques* contain many sportive songs and other light pieces, which are yet read with pleasure. He was the first writer of idyls in French verse, and is considered as the real founder of French satire, which he redeemed from the grossness that had hitherto characterized the productions that went under that name.

VAUX, ROBERTS, 1786-1836; b. Philadelphia; a member of the society of Friends. He was for a short time before his death judge of the county court. Most of his life was devoted to charity, to education, and to the reform of the penal code. He was an advocate of the so-called "separate system" of punishment. Among his works are: *Memoirs of the Life of Anthony Benezet* (1817); and *Notices of the Original and Successive Efforts to Improve the Discipline of the Prison at Philadelphia* (1826).

VAUX, WILLIAM SANDYS WRIGHT, b. England, 1818; educated at Westminster and Oxford. He entered the department of antiquities in the British museum in 1841; was made keeper of the department of coins and medals in 1861, and resigned in 1870. Among his works are: *Nineveh and Persepolis; Persia, from the Earliest Period to the Arab Conquest* (1875); and *Greek Cities and Islands of Asia Minor* (1877).

VAUXHALL', a famous public garden in London, constituted as such immediately after the restoration (May, 1660), and supporting that character for nearly two centuries. It was situated in Lambeth, opposite Millbank, and near the manor called Fulke's hall (the residence of Fulke de Breauté, a follower of king John), from which is derived the name Vauxhall. Pepys, writing May 28, 1667, describes the garden, and concludes that the entertainments there to be had are "mighty divertising." But the pastimes of Vauxhall were not always of a merely "divertising" description. The eating, drinking, dancing, and flirtation that continually went on there led to much quarreling and dissipation. On the whole, Vauxhall does not appear to have been particularly strict in its morals. The loose character of the amusements it afforded is freely sketched by the dramatists and novelists of the last century, and is again revived in Thackeray's *Vanity Fair*.

VAUXHALL NECTAR, a mixture of rum and syrup, with an addition of benzoic acid, or flowers of Benjamin, in the proportion of half a dram to the quart. It was formerly in much repute as a drink, and was taken mixed with water. It was also called British arrack.

VA'VASOUR, or VALVASSOR (derived, like *vassal*, from Celtic *gwás*, a youth or page), a term of feudal times, more in use in the continent of Europe than in England, employed somewhat loosely, and defined by Camden as the rank next below a baron. Its usual meaning was one who held his lands, not directly of the crown, but of one of the higher nobility. In this class were comprehended the *châtelains*, who owned castles or fortified houses, and possessed rights of territorial justice.

VAYGACH' (also written *Vaigatch*, *Vaigatz*, and *Waigatz*), an island of the Arctic ocean, belonging to Russia, stands between the main land and the island of Nova Zembla, from the former of which it is separated by a strait about 5 m. broad. There is no resident population; but, being productive in furs and in fish, it annually attracts a number of Roman and Samoied hunters.

VÂYU (from the Sanskrit *vā*, blow), the wind, is, in the Vedic mythology of the Hindus, a deity, which originally seems to have held an equal rank with Indra (q.v.), but much more rarely occupies the imagination of the poets than this god, or Agni, or the sun; for though, according to Yaska (q.v.), ancient commentators of the Vedas hold that there are only three great deities—viz., *Agni*, fire, whose place is on earth; *Sûrya*, the sun, whose place is in heaven; and *Vāyu*, or *Indra* (q.v.), whose place is in the intermediate sphere—only a few hymns, comparatively speaking, are dedicated to Vāyu, whereas the other deities named are the subject of manifold praise. The description given by the R'igveda of the greatness of Vāyu nevertheless answers the position which those ancient commentators assign to him.—See J. Muir's "Contributions to a Knowledge of the Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society* for 1864. In the epic and Purānic mythology, Vāyu occupies but an inferior position, and the legends there related of him have no cosmical character. They give him a wife, *Anjanā*, by whom he has a son, the monkey *Hanumat* (q.v.). When represented, Vāyu either rides on an antelope, with a saber in his hand, or he is seated holding his son Hanumat in his arms.

VAYU-PURÂN'A. See **PURÂN'A**.

VEDA (from the Sanskrit *vid*, know; kindred with the Latin *vid*-, Greek *id*-, Gothic *vait*-, Lithuanian *veid*-; hence, literally, knowledge) is the technical name of those ancient Sanskrit works on which the first period of the religious belief of the Hindus is based. See **INDIA**, sec. *Religion*. The oldest of these works—and in all probability the oldest literary document still existing—is the *R'igveda*; next to it stand the *Yajurveda* and *Sāmaveda*; and the latest is the *Atharvaveda*. The first three also bear the collective title of *trayī*, or "the threefold" (scil. science); and all four are considered to be of

divinely inspired origin. Each of these Vedas consists of two distinct divisions—a *Sanhitā*, or collection of *mantras*, or hymns; and a portion called *Brāhman'a*. A *mantra* (from *man*, think; hence, literally, the means by which thinking or meditation is effected) is, as Colebrooke, in conformity with the *Mīmāṃsā* writers, defines the word, a prayer, or else a thanksgiving, praise, or adoration addressed to a deity: it declares the purpose of a pious act, or lauds or invokes the object; it asks a question, or returns an answer; either directs, inquires, or deliberates, blesses or imprecates, exults or laments, counts or narrates, etc. Sometimes it is addressed to the deity with a verb in the first person; sometimes it ends with the verb "thou art," or with the word "thee." See Colebrooke, *Miscellaneous Essays*, i. p. 308; Müller, *Ancient Sanskrit Literature*, p. 343; Jaiminiyan-yāyama-lāvistara, as quoted in Goldstücker's *Pāṇini*, p. 69. If such a *mantra* is metrical, and intended for loud recitation, it is called *R̥ch* (from *r̥ch*, praise)—whence the name *R̥gveda*, i.e., the Veda containing such praises—if it is in prose, and then it must be muttered inaudibly, it is called *Yajus* (from *yaj*, sacrifice; hence, literally, the means by which sacrificing is effected); therefore, *Yajurveda* signifies the Veda containing such *yajus*. And if it is metrical, and intended for chanting, it is termed *Sāman*; whence *Sāmaveda* means the Veda containing such *sāman*. (The original meaning of the latter word is obscure. Native grammarians derive it, but without much probability, from *so*, to give pain, because, they say, "it is difficult to utter such mantras." A mystical, but grammatically impossible, account of *sāman* is given in the *Satapatha-brāhman'a* and *Br̥hadāraṇyaka*, where the word is analyzed into *sā* and *ama*, the former being interpreted as implying "speech," and the latter "breathing forth," since the chanting of the *sāman*, as the commentator says, is essentially the result of both.) No special name is given to the mantras of the fourth Veda. The author of the mantra, or, as the Hindus would say, the inspired "seer," who received it from the deity, is termed its *R̥ishi* (q.v.); and the object in which the mantra is concerned is its *devatā*—a word which generally signifies "deity," but the meaning of which, in its reference to the mantras, must not always be taken literally, as there are hymns, in which not gods or deified beings, but, for instance, a sacrificial post, a remedy against bad dreams, the generosity of princes from whom gifts were received by the authors, or a chariot, a drum, weapons, the charioteer and horses employed in war, and other worldly objects, invoked, are considered as the *devatā*.—See Colebrooke's *Misc. Essays*, i. p. 22; Wilson's *R̥gveda*, vol. i., in the edition of F. E. Hall, p. 347.—*Brāhman'a*—derived from *brahman*, neuter, probably in the sense of prayer or hymn (see concerning this word, J. Muir, "On the Relation of the Priests to the other Classes of Indian Society in the Vedic Age," in the *Journal of the Royal Asiatic Society* for 1864; and the introduction of M. Haug's edition of the *Aitareya Brāhman'a* vol. i. p. 4)—designates, according to *Mādhava-Sāyan'a*, the great commentator on the Vedas, that portion in prose of the Vedas which contains either commandments or explanations; or, in other words, which gives injunctions for the performance of sacrificial acts, explains their origin, and the occasions of which the mantras had to be used, by adding sometimes illustrations and legends, and sometimes also mystical and philosophical speculations. (The *Brāhman'a* portion of the Vedas is therefore the basis on which the Vedic ritual rests (see *KALPA* and *VEDĀNGA*), and whence the *Upanishads* (q.v.) and the philosophical doctrines (see *SANSKRIT LITERATURE*) took their development.

Though *Mantras* and *Brāhman'as*—both of which are also termed *S'ruti* (q. v.)—were held at a later period of Hinduism to have existed simultaneously, that is, from eternity, it is certain that the *Brāhman'a* portion of each Veda is posterior to at least some part of its *Sanhitā*, for it refers to it; and it scarcely requires a remark that so great a bulk of works as that represented by both portions must have been the gradual result of a considerable period of time. There is, indeed, sufficient evidence to prove that various conditions of society, various phases of religious belief, and even different periods of language are reflected by them. The difficulty, however, critically to discern these periods, is enhanced by the losses, probably considerable, which these writings suffered before they were preserved in the shape in which we now possess them. For in tradition, which records that *Viśva* (q.v.), after having compiled and arranged the Vedas, handed each of them to four disciples, and that these disciples taught them to their disciples, and so forth, down to distant ages, there is so much indubitable, that *Mantras* and *Brāhman'as* had to pass through a large number of *Sākḥās*, or schools, and that the discrepancies which gradually arose between these schools, both as regards the Vedic texts and the interpretation of these texts, cannot have been slight; for, apart from the conclusion yielded by a comparison of the remaining texts of some of these schools, later writers afford us an insight into the animosity which existed between these schools, and must have arisen from very material grounds. Thus, in a commentary on *Pāraskara's Gṛ̥hya Sātras*, it is said: "Vasishṭha declares that it is wrong to follow the rules of another *Sākḥā*." He says, "A wise person will certainly not perform the duties prescribed by another *Sākḥā*; he that does is called a traitor to his *Sākḥā*. Whosoever leaves the law of his *Sākḥā*, and adopts that of another, he sinks into blind darkness, having degraded a sacred *R̥ishi*." And in another law-book it is said: "If a man gives up his own customs, and performs others, whether out of ignorance or covetousness, he will fall, and be destroyed." And again in the *Parīśiṣṭa* of the *Chhandogas*: "A fool who ceases to follow his own *Sākḥā*, wishing to adopt another one, his work will be in vain."—See Müller's *Ancient Sanskrit Literature*, p. 51. That each *Sākḥā* claimed

the possession of the only true and genuine Veda, may be already inferred from passages like these. The difference between these Sâkhâs, however, did not consist—as has been believed—in their various readings of the S'ruti alone; it also consisted in considerable variations of their arrangement of the Scriptures; in their additions or omissions of texts—as may be seen from still existing Sâkhâs of the Yajurveda—and, as is stated by *Mudhusûdana*, and results from a commentator on Pân'ini, in their *different interpretation of the Vedic texts*. How great the number of these Sâkhâs was, may be inferred from the statement of the *Charan'aryâha*, a treatise ascribed to an ancient writer. S'au-naka; for it enumerates five Sâkhâs of the R'igveda; says that there were 86, and names 42 (or in one recension 44) of the Yajurveda; mentions twelve of the Sâmaveda, out of a thousand, which, it says, were at one time in existence, and nine of the Atharvaveda. The *Atharvan'arâhasya*, a modern treatise on the Atharvaveda, while ascribing the same number of Sâkhâs to the Sâmaveda and Atharvaveda, speaks of twenty-one of the R'igveda, and a hundred of the Yajurveda. Of all these schools, however, the *R'igveda* is now extant only in one; the *Yajurveda* (both divisions to be named hereafter, taken collectively) in three and partially in four; the *Sâmaveda* in perhaps two; and the *Atharvaveda* in one.

The character of the Sanhîtâ or Mantra portion of the four Vedas—on which their Brâhman'a portion is based—as well as the relation in which these Sanhîtâs stand to each other, is intelligible only if it is borne in mind that the ancient Hindu believed to secure the favors of his gods chiefly by the performance of sacrificial rites; that gradually these rites became complicated and manifold, and that special care, therefore, had to be taken to provide for a correct celebration of the sacrifices which had sprung up, and also to guard against the evil consequences which might result from inadvertence, or other causes beyond the sacrificer's control. The original worship seems to have been simple enough (see INDIA, sec. religion)—it probably neither occupied much time, nor required the assistance of a priest. But when sacrifices were instituted which lasted from one day to eleven, nay, to a hundred days—and some works speak of sacrifices which went on for the space of one and even several years—and when the Brahmanic caste found the performance of such sacrifices to be an excellent means of establishing its sway over the other castes, and a convenient source of an easy livelihood, it was laid down as a rule that no sacrifice could be performed without one *R'itwîj*, or priest; and that a great sacrifice, such as the *Jyotisht'oma*, *Râjasûya*, or other sacrifices which could only be celebrated by wealthy people or kings, required the assistance of not less than sixteen priests, besides a number of menials, who had to slay the sacrificial animals, to chant, or to perform other inferior work. These sixteen priests were then divided into four sections, each headed by one *R'itwîj*, and containing besides him, his three *purushas*, or assistants. The first section consisted of the *Adhwaryu*, with his three *purushas*, the *Pratiprasthât'ri*, *Nesht'ri*, and *Unit'ri*; the second, of the *Brahman*, with the three *purushas*, *Brâhmanâchchhansin*, *Agnidh* (or *Agnidhra*), and *Potr'i*; the third, of the *Udgât'ri*, with the *Prastotr'i*, *Pratihartr'i*, and *Subrahman'ya*; and the fourth of the *Hot'ri*, whose assistants were the *Maitrâvarun'a*, *Achchhâvâka*, and *Grâvastut*. (In other accounts the order of these sections varies, and in the section headed by the Brahman, the *Potr'i* precedes the *Agnidh*; see also Müller, *Ancient Sanscrit Lit.*, pp. 468-69; where, however, by mistake, some of the assistant priests occur in the wrong sections.) The principal duties of these priests were further regulated in the following manner. The *Hot'ri* had to perform the rites relating to the R'igveda, the *Adhwaryu* those based on the Yajurveda; the *Udgât'ri* was concerned in the rites of the Sâmaveda; and the Brahman had to possess a knowledge of all these three Vedas, and to set right any mistake that might have occurred in the performance of the ritual acts, or remedy any defect which might vitiate the efficiency of the sacrifice. He was therefore the most learned of all the priests; and the R'igveda itself, though perhaps in one of its latest portions, recognizes the superiority of the priest Brahman. In the ritual works relating to the first three Vedas, no functions based on the use of the latest or the Atharvaveda are assigned to him, but in the *S'au-naka-Brâhman'a* of the *Atharvaveda*, where *Prajâpati* is introduced as intending to perform a soma sacrifice, and asking the Vedas whom he should choose for his *Hot'ri*, *Adhwaryu*, *Udgât'ri*, and Brahman, the Vedas answer him: "Choose for a *Hot'ri* (the priest) who knows the R'igveda; for an *Adhwaryu*, (the priest) who knows the Yajurveda; for an *Udgât'ri*, (the priest) who knows the Sâmaveda; and for a Brahman (the priest) who knows the Atharvaveda;" and to explain the reason for such advice, they add that the R'igveda hymns having the earth for their abode, one who chooses a *Hot'ri* will obtain dominion over the earth; the Yajurveda mantras resting on the intermediate space, one who engages an *Adhwaryu* will obtain the world of that space; the Sâmaveda hymns dwelling on heaven, one who employs an *Udgât'ri* will obtain that world; but one who chooses a Brahman will encompass the world of (the neuter) Brahman, or the supreme spirit, since the hymns of the Atharvaveda have for their abode Brahman.

The most interesting feature of this and similar passages is the tendency of their authors to maintain the greater efficiency of one of the later Vedas in comparison to that of the R'igveda, and consequently the greater practical superiority of these Vedas over the avowedly oldest Veda. And this is intelligible enough if we compare the contents of these Vedas.

The worship alluded to in many hymns of the Rîgveda must have consisted more of isolated sacrificial offerings than of a series of acts strung together so as to form an elaborate sacrifice. There are other hymns, it is true, which betray the existence, at their time, of a ritual, already become complicated, as when three or four, or even seven, priests are mentioned by the poet; but though these hymns, as well as the former, bear testimony to the existence, at that early period, of ritual acts, it does not follow that the Rîgveda, as such, was composed for the purpose of being recited when they were performed. From the nature of its hymns, it results, on the contrary, that, having been composed, they were at some subsequent period connected with those pious acts which became more and more complicated, and gradually were systematized. But then even there remain verses which would not easily bend to such artificial purposes; and whole hymns, too, which would resist an attempt to force them into a liturgic code for which they were not intended by the poet's mind. A collection of songs, in short, which was the natural growth of time, and, to some extent, at least, the ingenuous outburst of the poets' feelings, became inadequate for a regular liturgy of a highly-developed and throughout artificial ritual. Out of this necessity there arose the *Sâma*- and the *Yajur-veda*. The former was entirely made up of extracts from the Rîgveda, put together so as to suit the ritual of the so-called Soma sacrifices. For, as all native authorities agree in stating that the Sâma-veda contains none but Rîgveda verses, the absence of 71 verses in the recension of this Veda, edited by prof. Benfey, from the recension in which the Rîgveda now exists, does not disprove their unanimous statement; it must be accounted for by the circumstance that these verses belonged to one or the other of the recensions of the Rîgveda, which, as mentioned before, are no longer preserved. The origin of the Yajurveda is similar to that of the Sâma-veda; it, too, is chiefly composed of verses taken from the Rîgveda; but as the sphere of the ritual for which the compilation of this Veda became necessary is wider than that of the Sâma-veda, and as the poetry of the Rîgveda no longer sufficed for certain sacrifices with which this ritual had been enlarged, new mantras were added to it—the so-called Yajus, in prose, which thus became a distinctive feature of this Veda; and it is on the Yajurveda, therefore, that the orthodox Hindu looked with especial predilection, for it could better satisfy his sacrificial wants than the Sâma-, and still more, of course, than the Rîgveda. “The Yajurveda,” says *Sâyana*, in his introduction to the Taittiriya Sanhitâ, “is like a wall, the two other Vedas like paintings (on it).” The sacredness of the Sâma- and Yajurveda, and the belief in their inspired character, rest on the assumption that they are of the same origin as the Rîgveda, which dates from eternity, and which was “seen” by the Rishis who uttered it. That, in the case of the Yajurveda, this theory is only partially correct, results already from the description just given of it; for whatever losses the present text of the Rîgveda may have suffered, it is admitted by all authorities that its mantras were always metrical, and that it can never, therefore, have possessed passages in prose. But how frail this theory is, and in what sense it is possible to speak of the sameness of origin even in the case of those hymns of the Sâma- and Yajurveda which are composed of Rîgveda verses, a comparison of the place occupied by the verses of a few hymns taken from one and the other of these Vedas with the place which the same verses occupy in the Rîgveda, will sufficiently show.

The first hymn of the Sâma-veda consists of ten verses, nine of which are contained in the present recension of the Rîgveda. If by the side of each of these verses the place is marked which it holds in the Rîgveda, the result is this:

	Book.	Hymn.	Verse.
Sâma-veda 1, verse 1, is Rîgveda.....	6	16	10
“ “ 2, “	6	16	1
“ “ 3, “	1	12	1
“ “ 4, “	6	16	34
“ “ 5, “	8	73	1
“ “ 6, “	8	60	1
“ “ 7, “	6	16	16
“ “ 8, “	8	11	7
“ “ 9, “	6	16	13

The verses of which the hymn of the Sâma-veda 1, verses 370–380, is composed, correspond with the following verses of the Rîgveda:

	Book.	Hymn.	Verse.
Sâma-veda 1, verse 370, with Rîgveda.....	8	86	10
“ “ 371, “	10	147	1
“ “ 372, “		absent	
“ “ 373, “	1	37	4
“ “ 374, “	3	51	1
“ “ 375, “	10	43	1
“ “ 376, “	1	51	1
“ “ 377, “	1	52	1
“ “ 378, “	6	70	1
“ “ 379, “	10	134	1
“ “ 380, “	1	101	1

If from the White Yajurveda the mantras, for instance, of the 22d to the 25th chapter were submitted to a similar test, it would be seen that in chapter 22, which has 84 divisions, only four verses occur in the R'igveda, viz.:

	Book.	Hymn.	Verse.
White Yajurveda 22, verse 10, in R'igveda	1	22	5
" " 15, " 	5	14	1
" " 16, " 	3	11	2
" " 18, " 	9	110	3

that in chapter 23, with 65 divisions, there correspond:

	Book.	Hymn.	Verse.
White Yajurveda 23, verse 3, with R'igveda	10	121	3
" " 5, " 	1	6	1
" " 6, " 	1	6	2
" " 16, " 	1	162	21
" " 32, " 	4	39	6

that of chapter 24 being in prose, cannot occur in the R'igveda; and that of chapter 25, with 47 divisions:

	Book.	Hymn.	Verse.
White Yajurveda 25, verse 12, is R'igveda.....	10	121	4
" " 13, " 	10	121	2
" " 14-23 are " 	1	89	1-10
" " 24-45 " 	1	162	1-22
" " 46 is " 	10	157	1, 3, 2

See the article "The Inspired Writings of Hinduism," in the *Westminster Review* for Jan., 1864.)

All, therefore, that is left of the oldest Veda in the Sāmaveda and Yajurveda, is a R'igveda piecemeal; its hymns scattered about; verses of the same hymn transposed; verses from different hymns combined, and even the compositions of different poets brought into one and the same hymn, as if they belonged to the same authorship. That, under such treatment, the Yajurveda should have lost all poetical worth, is but what may be expected; it must be, however, matter of surprise that the Sāmaveda should have saved so much, as it even now possesses, of that genuine beauty which distinguishes the R'igveda poetry. The *Atharvaveda*, too, is made up in a similar manner as the Yajurveda, with this difference only, that the additions in it to the garbled extracts from the R'igveda are more considerable than those in the Yajurveda. It is avowedly the latest Veda, and even its name, "Atharvaveda," as it was current already during the classical period of Sanskrit literature, does not yet occur in the oldest Upanishads (q.v.), where only the songs or revelations of the *Atharva-Angīras*, or of the *Bhrigu-Angīras*, apparently denoting this Veda, are spoken of. The Atharvaveda was not used, as Madhusūdana, in his treatise on Sanskrit literature says, "for the sacrifice, but merely for appeasing evil influences, for insuring the success of sacrificial acts, for incantations, etc.;" but on this very ground, and perhaps on account of the mysteriousness which pervades its songs, it obtained, among certain schools, a degree of sanctity which even surpassed that of the older Vedas.

This being the general character of these four Vedas, a few remarks must here suffice to convey some idea of their special contents.

On the religious ideas expressed in the *R'igveda*, a general account is given in the article INDIA, sec. *Religion*; see also, besides the deities mentioned there, and the articles referring to them, VARUN'A, VĀYU, and YAMA, and J. Muir's "Contributions to a Knowledge of Vedic Theogony and Mythology," in the *Journal of the Royal Asiatic Society* for 1864. The social condition of the Hindus, as reflected from the hymns of this Veda, is not that of a pastoral or nomadic people, as is sometimes supposed, but, on the contrary, betrays an advanced stage of civilization. Frequent allusion is made in them to towns and cities, to mighty kings, and their prodigious wealth. Besides agriculture, they mention various useful arts which were practiced by the people, as the art of weaving, of melting precious metals, of fabricating cars, golden and iron mail, and golden ornaments. The employment of the needle and the use of musical instruments, are known to them. They also prove that the Hindus of that period were not only familiar with the ocean, but sometimes must have engaged in naval expeditions. They had some knowledge of medicine, and must have made some advance in astronomical computation, as mention is made of the adoption of an intercalary month, for the purpose of adjusting the solar and lunar years. Nor were they unacquainted with the vices of civilization, for we read in these hymns of common women, of secret births, of gamblers and thieves. There is also a curious hymn, from which it would follow that even the complicated law of inheritance, which is one of the peculiarities of the existing Hindu law, was to some extent already in use at one of the periods of the R'igveda hymns. The institution of caste, however, seems at that time to have been unknown; for there is no evidence to prove that the names which at a later period were current for the distinction of caste, were employed in the same sense by the poets of these hymns.—See Wil-

son's *Rigveda*, vol. i., re-edited by F. E. Hall, vols. ii., iii.; and vol. iv., edited by E. B. Cowell (Lond. 1850-66).

The only recension in which the Sanhitâ of the *Rigveda* has been preserved to us, is that of the *Sâkala* school; and the hymns themselves are arranged according to two methods, the one chiefly considering the material bulk, the other the authorship of the hymns. Both divisions, however, run parallel. According to the former, the whole Sanhitâ consists of eight *Ashṭakas*, or eights; these, again, are divided into 64 *Adhyâyas*, or lessons; these into 2,006 *Vargas*, or sections; and the *Vargas* into *Richs*, or verses, the actual number of which is 10,417, but, according to the statement of native authorities, seems at some other time to have amounted to 10,616 or 10,622.—According to the other method, the Sanhitâ is divided into 10 *Man'dalas*, or "circles;" the *Man'dalas* into 85 *Anuvâkas*, or "sections;" these into 1017, and 11 additional, i.e., into 1028 *Sûktas*, or "hymns," and the hymns into *Richs*, or verses, the number of which coincides, of course, with that of the former arrangement. The number of *padas*, or words, in this Sanhitâ is stated as being 153,826.

In eight out of the ten *Man'dalas*, the first hymn or hymns are addressed to *Agni*; the next hymn or hymns generally to *Indra*; and after these come hymns to the *Viśvâ Devâs*—the deities collectively—or hymns to other special deities. The eighth *Man'dala* begins with hymns to *Indra*, and the ninth is chiefly devoted to *Soma*.

As for the authorship of the hymns, the second *Man'dala* belongs chiefly to that of *Grîsamada*, the third chiefly to that of *Viśvâmitra*, and the fourth chiefly to that of *Vâmadeva*. The fifth was composed chiefly by *Atri*, and members of his family; the sixth by *Bharadvâja* and members of his family; the seventh by *Vasishṭha* and his kin; the first, eighth, ninth, and tenth by various *Rishis*.—The text of the Sanhitâ has been edited in Roman characters by prof. Th. Aufrecht (Berlin, 1861); and the text, with a commentary of *Sâyana*, is published by prof. Max Müller, there having already appeared vols. i.-vi. of this edition (Lond. 1849-74). Of translations, the first volume of one by Max Müller appeared in 1869; that by the late prof. H. H. Wilson, which was left by him completed in manuscript, follows the commentary of *Sâyana*, based on Hindu tradition; that begun by prof. Benfey in the *Journal Orient und Occident*, vols. i. and ii. (Gött. 1862-64), is essentially speculative.

The *Brâhman'a* portion of the *Rigveda* is preserved in two works only—the *Âitareya Brâhman'a*, which consists of eight *Panchikâs*, or "pentades," each of these comprising five *Adhyâyas*, or "lessons," and all the *Adhyâyas* together, 285 *Khan'das*, or "portions;" and the *Sâṅkhâyana*, or *Kaushîtuki-Brâhman'a*, containing 30 *Adhyâyas*, also subdivided into a number of *Khan'das*. The following specimens, selected from the former, may illustrate the manner in which works of this category enjoin sacrificial rites and explain their secret meaning. The first relates to the ceremony of carrying the *Soma* (q.v.). "The king *Soma* lived among the *Gandharvas*. The gods and *Rishis* deliberated as to how the king might be induced to return to them. *Vâch*, the goddess of speech, said: "The *Gandharvas* lust after women. I (therefore) shall transform myself into a woman, and then you sell me to them (in exchange for *Soma*)." The gods answered: "No! how may we live without thee?" She said: "Sell me unto them; if you should want me, I shall return to you." Thus they did. In the disguise of a big naked woman, she was sold (by the gods to the *Gandharvas*) in exchange for *Soma*. In imitation (of this precedent), men drive away an immaculate cow of one year's age, this being the price at which they purchase the king *Soma*. This cow may, however, be rebought; for *Vâch* returned to the gods. Hence the *Mantras*, after *Soma* has been bought, are to be repeated with a low voice. After *Soma* has been bought, the goddess of speech is with the *Gandharvas*; but she returns as soon as the ceremony of carrying the sacred fire is performed."

The following are the speculations of this *Brâhman'a* on the *Yâpa*, or sacrificial post, and the meaning of the sacrificial animal:

"(The theologians) argue the question: Is the *Yâpa* to remain standing (before the fire); or is it to be thrown (into the fire)? (They answer:) For him who desires cattle, it may remain standing. (About this, the following legend is reported.) Once upon a time, cattle did not stand still to be taken by the gods for food. After having run away, the cattle stood still, and, turning toward the gods, said repeatedly: "You shall not obtain us. No, no!" Thereupon the gods saw that *Yâpa*-weapon which they erected. Thus they frightened the animals, which then returned to them. That is the reason that, up to this day, the sacrificial animals are turned toward the *Yâpa* (their head being bent toward the sacrificial post to which they are tied). Then they stood still to be taken by the gods for their food. . . . The man who is initiated (into the sacrificial mysteries) offers himself to all deities. *Agni* represents all deities, and *Soma* represents all deities. When the sacrificer offers the animal to *Agni* and *Soma*, he releases himself from being offered to all deities. Some say: "The animal to be offered to *Agni* and *Soma* must be of two colors, because it belongs to two deities." But this precept should not be attended to. A fat animal is to be sacrificed, because animals (compared to the sacrificer) are fat, and he (compared to them) is lean. When the animal is fat, the sacrificer thrives through its marrow. Some say: "Do not eat of the animal offered to *Agni* and *Soma*. Who eats of this animal, eats human flesh, because the sacrificer releases himself (from being sacrificed) by means of the animal." But this precept, too, should

not be attended to. The animal offered to Agni and Soma was an offering to Indra, for Indra slew Vṛitra through Agni and Soma. Both then said to him: "Thou hast slain Vṛitra through us; let us choose a boon from thee." "Choose yourselves," answered he. But they choose this boon from him; and thus they receive (now as their food) the animal which is sacrificed the day previous to the Soma feast. This is their everlasting portion chosen by them; hence one ought to take pieces of it, and eat them."—See M. Haug's edition and translation of the *Āitareya Brāhmaṇa*'s (vol. ii. pp. 59, 78), vols. i., ii. (Bombay, 1863).

The principal object for which the *Sāmaveda* was compiled is the performance of those sacrifices of which the juice of the Soma plant is the chief ingredient; and of such sacrifices the most important is the *Jyotiṣṭoma*, which consists of seven stages: the Agnisht'oma, Atyagnisht'oma, Ukthya, Shod'as'in, Atirātra, Aptoryāma, and Vājapeya; but the performance of the Agnisht'oma alone was considered obligatory for those who wished to derive the chief advantage accruing from the celebration of this grand ceremony; while its other six stages, though adding to the merits of the sacrificer, were deemed voluntary. At the performance of such Soma sacrifices, the verses of the *Sāmaveda* were intoned; and there are special song-books which teach the proper manner how to chant them. The Sanhitā of the *Sāmaveda* is preserved in two recensions: in that of the *Rān'āyana*, and probably also the *Kaṭhuma* school. It consists of two parts: the first, the *Chhândograntha*, also called *Archika*, or *Pûrârchika*, contains, in the present recension, 585 verses, which are arranged into 59 *Dasatî* or decades, these being divided into *Prapât'hakas*, or chapters, and the latter, again, into *Arđhaprapât'hakas*, or half-chapters. The second portion, called *Staubhika*, or *Uttarâgrantha*, or *Uttarârchika*, consists of 1225 verses, distributed over nine *Prapât'hakas*, which, too, are subdivided into *Arđhaprapât'hakas*. And there is this peculiarity in the *Uttarâgrantha*, that being for the most part arranged according to triplets of verses, the first verse of these triplets is frequently one which also occurs in the *Archika* portion. It is then called the *Yoni*, or parent verse, because the subsequent two, the *Uttarâ*, are symbolically its children, since they participate of all the modulations, stoppages, and other modifications which may occur in the chanting of the "parent" verse. These modulations, etc., are taught in the *Gānas*, or song-books mentioned before, two of which, the *Vyagāna* and *Araṇ'yagāna*, relate to the *Archika*; and two others, the *Ugāna* and *Uhyagāna*, to the *Staubhika* part. The text of the *Sāmaveda*-Sanhitā, in the *Rān'āyana* recension, has been edited and translated by Dr. J. Stevenson (Lond. 1842-43), and by prof. Th. Benfey (Leip. 1848).

The number of *Brāhmaṇa*'s relating to this Veda is, by the native authorities, given as eight; and their names are: the *Praud'ha*-, or *Punchavins'a*-, the *Shad'vins'a*-, the *Sāmavidhî*-, or *Sāmavidhāna*-, the *Arsheya*-, the *Devatâdhyaṇya*-, the *Vans'a*-, the *Sanhita-panishad-Brāhmaṇa*'s; and the *Upanishad*, which probably is the *Chhândogya-Upanishad*, and thus is ranked among the *Brāhmaṇa*'s. A later *Brāhmaṇa*'s, probably of modern date, and which is not mentioned by *Sāyaṇa*'s, is the *Adbhuta-Brāhmaṇa*'s. The latter and the *Vans'a Brāhmaṇa* have been edited by prof. A. Weber; the former in the *Indische Studien*, vol. iv. (Berlin, 1858); the latter in the *Abhandlungen der königlichen Akademie der Wissenschaften zu Berlin* (1858).

The history of the *Yajurveda* differs in so far from that of the other Vedas, as it is marked by a dissension between its own schools far more important than the differences which separated the schools of each other Veda. It is known by the distinction between a *Yajurveda*, called the *Black*, and another, called the *White Yajurveda*. Tradition, especially that of the *PNrân*'s, records a legend to account for it. *Vais'ampāyana*, it says, the disciple of Vyāsa, who had received from him the *Yajurveda*, once having committed an offense, desired his disciples to assist him in the performing of some expiatory act. One of these, however, *Yājñavalkya*, proposed that he should alone perform the whole rite; upon which, *Vais'ampāyana*, enraged at what he considered to be the arrogance of *Yājñavalkya*, uttered a curse on him, the effect of which was that *Yājñavalkya* disgorged all the *Yajus* texts he had learned from *Vais'ampāyana*. The other disciples, having meanwhile been transformed into partridges (*tittirî*), picked up these tainted texts, and retained them. Hence these texts are called *Taittirîyas*. But *Yājñavalkya*, desirous of obtaining other *Yajus* texts, devoutly prayed to the sun, and had granted to him his wish—"to possess such texts as were not known to his teacher." And because the sun on that occasion appeared to *Yājñavalkya* in the shape of a horse (*vāja*), those who studied these texts were called *Vājins*. That part of this legend was invented merely to account for the name of the *Taittirîyas*, after whom a Sanhitā and *Brāhmaṇa*'s of the Black *Yajurveda*, and for that of the *Vajasaneyins*, after whom the Sanhitā of the White *Yajurveda* is named, is clear enough. Nor is greater faith to be placed on it when it implies that the origin of this dissension ascended to the very oldest period of the *Yajurveda*; for there is strong reason to assume that the division took place even after the time of the grammarian *Pāṇini* (q.v.). See Goldstücker's *Pāṇini*, p. 139, ff. But so much in it is consistent with truth—that the Black *Yajurveda* is the older of the two; that the White *Yajurveda* contains texts which are not in the Black; and that, compared to the motley character of the former, it looks "white," or orderly. This motley character of the Black *Yajurveda*, however, arises from the circumstance, that the distinction between a Mantra and *Brāhmaṇa* portion is not so clearly established in

it as in the other Vedas; hymns and matter properly belonging to the Brāhman'as there being intermixed. This defect is remedied in the White Yajurveda; and it points, therefore, to a period when the material of the old Yajus was brought into a system consonant with prevalent theories, literary and ritual.

The contents of both divisions of the Yajurveda are similar in many respects. Two of the principal sacrifices of which they treat are the *Dars'apīrṇ'amśa*, or the sacrifice to be performed at new and full moon, and the *As'vamedha*, or the horse-sacrifice, at the performance of which 609 animals of various descriptions, domestic and wild, were tied to 21 sacrificial posts. A *Purushamedha*, or man-sacrifice, unknown to the other Vedas, is also mentioned in it; its character, however, is symbolical.

The text of the Black Yajurveda is extant in the recension of two schools—that of *Apastamba*, to which the *Taittirīya Sanhitā* belongs, and that of *Charaka*. The former, which is in course of publication—the first volume and part of the second having been already published, with the commentary of Mādhavāchārya (Śāyan'a), by Dr. E. Roer and E. B. Cowell in the *Bibliotheca Indica* (Calcutta, 1860-64)—consists of seven *Kāṇḍa*, or books, which comprise 44 *Prapāṭhaka*, or chapters, subdivided into 651 *Anuvāka*, or sections, and containing 2,198 *Kāṇḍ'ikās*, or portions.

The *Vājasaneyi-Sanhitā*, or the Sanhitā of the White Yajurveda, exists in the recension of the *Mādhyandina* and *Kāṇḍa* school. In the former—the text of which, apparently also with the commentary of *Mādhava*, has been edited by prof. A. Weber (Berlin, 1852)—this Sanhitā has 40 *Adhyāyas*, or books, subdivided into 303 *Anuvākas*, with 1975 *Kāṇḍ'ikās*.

The principal Brāhman'a of the Black Yajurveda is the *Taittirīya-Brāhman'a*, which, with the commentary of (Mādhava) Śāyan'a, is in the course of publication by Baloo Rajendralāla Mitra—the first volume and part of the second having already appeared in print (Calcutta, 1860-65) in the *Bibliotheca Indica*. That of the White Yajurveda is the *Satapatha-Brāhman'a*, the most complete and systematic of all Brāhman'as. Its text, with a semblance of the commentary of Śāyan'a, has been edited by prof. A. Weber (Berlin, 1855).

The Atharvaveda has no circle of sacrifices assigned to it. Its object is, as observed before, to teach how to appease, to bless, to curse, etc. "The most prominent characteristic feature of this Veda," prof. Whitney, one of its editors, remarks, "is the multitude of incantations which it contains; these are pronounced either by the person who is himself to be benefited, or, more often, by the sorcerer for him, and are directed to the procuring of the greatest variety of desirable ends. Most frequently, perhaps, long life, or recovery from grievous sickness, is the object sought: then a talisman, such as a necklace, is sometimes given, or, in very numerous cases, some plant endowed with marvellous virtues is to be the immediate external means of the cure; further, the attainment of wealth or power is aimed at, the downfall of enemies, increase in love or in play, the removal of petty pests, and so on, even down to the growth of hair on a bald pate."—*Journal of the American Oriental Society*, vol. iii. p. 308. It has been surmised (Müller's *Ancient Sanscrit Literature*, p. 447, ff.) that the hymns of the Atharvaveda "formed an additional part of the sacrifice from a very early time, and that they were chiefly intended to counteract the influence of any untoward event that might happen during the sacrifice." This is possible; but the great importance which the adherents of this Veda themselves attach to it, is found on other considerations than these. They argue, as appears from the treatise *Atharvan'arāhasya*, mentioned above, that the three other Vedas enable a man to fulfill the *dharma*, or religious law, but that the Atharva helps him to attain *moksha*, or eternal bliss. This doctrine is laid down, for instance, in the *Chūtuka Upanishad* of this Veda, when it says: "Those Brāhmanas and others who know the science of the (neuter) Brāhman contained in the *Brahmaveda*, become merged in Brāhman; and it is likewise inferred from other passages in the *Saunaka Brāhman'a*. The name of *Brahmaveda* itself, by which this Veda is also frequently called, is, therefore, explained by them, not as implying the Veda which belongs to the province of the priest Brāhman, but the Veda which contains the mysterious doctrine of Brāhman, the supreme spirit, into which the human soul becomes finally absorbed. It is probable, therefore, that the very uselessness of the Atharvaveda for sacrificial purposes, and the reluctance which was felt to base its sanctity merely on its incantations and spells, invested it in the mind of its followers, with a spiritual character, which was then fully developed in the numerous Upanishads (q.v.) now connected with it.

The text of the Atharvaveda is preserved only in the *Saunaka* school. Its Sanhitā consists in the present edition of it, of 20 *Kāṇḍ'as*, or books. Of these, the first 18 are subdivided into 34 *Prapāṭhaka*s, or chapters, with, altogether, 94 *Anuvāka*s, or sections, each containing a number of *mantras* (the 17th *Kāṇḍa* consisting of a single *Prapāṭhaka*). The 19th *Kāṇḍa* is not divided into *Prapāṭhaka*s, but into *Anuvāka*s, of which it contains seven; and the 20th likewise divided into *Anuvāka*s, has nine, of which the third is subdivided into three *Paryāyas*.—The text of this Sanhitā has been edited by profs. R. Roth and W. D. Whitney (Berlin, 1856).

The only existing Brāhman'a of this Veda is the *Saunaka- or Gopatha-Brāhman'a*. "That this Brāhman'a," prof. Müller observes, "was composed after the schism of the Charakas and Vājasaneyins, and after the completion of the *Vājasaneyi-Sanhitā*, may be gathered from the fact, that where the first lines of the other Vedas are quoted in the

Gopatha, the first line of the Yajurveda is taken from the Vājasaneyins, and not from the Taittiriya's."—*Ancient Sanskrit Lit.*, p. 452. Each of these Vedas received in time *Anukraman'is*, or indices, which give the first word of each hymn, the number of verse's the names of the deities, the name and family of the poets, and the meter of every verse. The principal treatise of this kind is the *Sarvānukraman'ī*, or "The General Index," ascribed to the authorship of *Saunaka*. For the theosophical works which grew out of these Vedas, see the article UPANISHAD; and for the works which were composed in order to secure a correct reading and understanding of the Vedic texts, and a correct performing of sacrificial acts, see the article VEDĀNGA.—At a later period the name of Veda was also bestowed on *Itihāsas*—legends or legendary works—and *Purāṇas* (q.v.), collectively; but in this sense it never obtained real currency. *Upavedas*, or minor Vedas, are also mentioned in the *Charan'aryūha* and other works, and explained by them in the following manner: The Upaveda of the R'igveda, they say, is the *Ayurveda*, or the Veda on medicine—probably the well-known works of Charaka and Suśruta; the Upaveda of the Yajurveda is the *Dhanurveda*, or the Veda on archery; the Upaveda of the Sāmaveda is the *Gāndhārvaveda*, on music; and the Upaveda of the Atharvaveda is the *Śilpaśāstra*, a work on mechanical arts, or, according to others, the *Arthśāstras*, works on practical subjects, comprising polity, mechanical science, the training of elephants and horses, and fencing.

In the preceding brief outline of the four Vedas, the question as to the date at which they were composed has not been raised, because, in the present condition of Vedic philology, an answer to it could only be hypothetical. From astronomical facts, based on a statement in a Vaidik calendar, Colebrooke concluded that this calendar was written in the 14th c. before the Christian era (*Miscell. Essays*, vol. i. pp. 109, 110); and though subsequent writers have questioned the full correctness of this conclusion, those most reliable nevertheless admit that the error, if any, could not lessen the antiquity of this calendar by more than 100 or 200 years. As this calendar must have been composed after the R'igveda had been arranged, and as such an arrangement itself must be posterior to the date of its last hymn, a full scope is left for imagination to fill up these intervals. But let it be understood that imagination alone would have to perform this task, since scientific research has as yet not yielded any means to check it, or prompt it on, as the case may be; nor is there any real prospect that future discoveries in Sanskrit literature will supply this want. A safer basis, however, may be looked for, if future research restricted itself to the question as to the *relative* age of these Vedic writings. Much valuable evidence has been already brought forward in this respect to prove that there are R'ishis ancient, and less ancient (see, for instance, J. Muir's *Original Sanskrit Texts*, vol. ii. p. 205, ff.); that there are R'igveda hymns older than others (for instance, in Müller's *Ancient Sanskrit Literature*); but, on the other hand, much confusion has also been produced by starting a theory that all the Brāhman'as belong to one period, and all the hymns to another period preceding it, of which, again, two stages were thought to be discernible, and by assigning dates to the Brāhman'a period, as well as to each of the two stages of the Mantra period. For, apart from the purely imaginary value of such dates, and apart from the circumstance that no evidence whatever has as yet been brought forward to justify an assumption of only two stages of hymns, each of which would comprise only 200 years, it is clear that the similarity of subject-matter alone—such as it marks the literary character of the Brāhman'as—cannot be a criterion for determining that *all* the Brāhman'as must be more recent than *all* the Sanhitās. That a Brāhman'a of the R'igveda must be posterior to those hymns of the R'igveda Sanhitā which it mentions, but to those alone—again, that a Brāhman'a of the Sāmaveda must be younger than the hymns of the Sāmaveda on which it relies, and so on—cannot be matter of doubt; but as the Sanhitā of the Sāmaveda, for instance, must be more recent than that of the R'igveda, and as no fact whatever has been adduced to show why the Aitar-eya Brāhman'a, or other Brāhman'as of the R'igveda, could not have appeared before a Sāmaveda-Sanhitā was made, and so forth in the case of the other Vedas, it follows that it would be entirely unsafe to infer that all the Brāhman'as must be more recent than all the Sanhitās; nay, even that all the Brāhman'as must be later than *all* the hymns of the R'igveda, since not all of them need have existed before the oldest Brāhman'a of this Veda was composed. A result like this is, unhappily, purely negative, but it may have the advantage of counseling caution and stimulating research.

VEDĀNGA—from Veda (q.v.) and *anga*, limb; hence, literally, "the limb of (the body of) the Veda"—is the name of six Sanskrit works, the object of which is to teach how to read and understand correctly the Vedic texts, and how to apply them correctly to sacrificial purposes. Whether the number of these works was originally the same as it now is, and already was at the time of the Upanishads, may be doubtful. Tradition mentions the following Vedāngas: 1. *Śikṣā*, or the science of proper pronunciation. It is represented by a short treatise of 35, or, in another recension, of 59 verses, which explains the nature of letters, accent, and pronunciation, and is ascribed to *Pāṇini* (q.v.). 2. *Chandas*, or (a work on) meter, which is ascribed to *Pingala*. 3. *Vyākaran'a*, or grammar, by which native authorities understand the celebrated work of *Pāṇini* (q.v.); but never those short books, especially concerned in Vedic peculiarities, called *Prātisāhikas*, the existing representatives of which, in all probability, are posterior to *Pāṇini* (see Gold-

stücker's *Pāṇini*, etc., p. 183, ff.). 4. *Nirukta* (q.v.) 5. *Jyotiṣa*, or astronomy. "Its chief object is to convey such knowledge of the heavenly bodies as is necessary for fixing the days and hours of the Vedic sacrifices." 6. *Kalpa*, or works on the Vedic ceremonial, which systematize the ritual taught by the Brāhmaṇa's portion of the Veda, omitting, however, all legendary or mystical detail. They are composed in the Sūtra style. See SŪTRA. The Kalpa, or Śrauta, Sūtras belonging to the R̥gveda are the *Asvalāyana*-, *Sāṅkhya*-, and *Saṃvaka Sūtras*; those relating to the Sāmaveda, the *Maṣaka*-, *Lātyāyana*-, and *Drāhyāyana* Sūtras; those of the Black Yajurveda, the *Apastamba*-, *Baudhāyana*-, *Satyashādhaka*-, *Hiranyakeśin*-, *Mānava*-, *Bhāradvāja*-, *Vādhūna*-, *Vaikhāṇasa*-, *Laugākṣi*-, *Maitra*-, *Kaṭha*-, and *Vārha* Sūtras. The White Yajurveda has only one Kalpa, or Śrauta, Sūtra connected with it, the *Kātyāyana* Sūtra, and the Atharveda likewise only one, the *Kuśika Sūtra*.—At a later period these works were supplemented by a similar class of works, which, however, merely describe the domestic ceremonies, viz., "the marriage rite, the rites to be performed at the conception of a child, at various periods before his birth, at the time of his birth, the ceremony of naming the child, of carrying him out to see the sun, of feeding him, of cutting his hair, and lastly, of investing him as a student, and handing him to a guru, under whose care he is to study the sacred writings." Works of this kind are called *Gr̥hya-Sūtras* (from *gr̥ha*, house), and to these, again, were added the *Sāmāyachārika-Sūtras* (from *sāmāyachāra*, conventional practice), which treat of customs sanctioned by the practice of pious men, but not enjoined or expressly stated in the Gr̥hya-Sūtras. The two last classes of Sūtras, which are not comprised amongst the Kalpa works, then grew into the *Dharmasāstras*, or law-books, of which that of *Manu* is the chief representative. See Müller's *Ancient Sanskrit Literature*, p. 108, ff.

VEDĀNTA (from the Sanskrit *veda* and *anta*, end; hence, literally, "the end or ultimate aim of the Vedas") is the second great division of the *Mīmāṃsā* (q.v.) school of Hindu philosophy. It is chiefly concerned in the investigation of *Brahman* (neuter), or the Supreme Spirit, and the relation in which the universe, and especially the human soul, stands to it; and in contradistinction from the *Pūrva-mīmāṃsā*, or the investigation (*mīmāṃsā*) of the former (*pūrvā*) part of the Vedas—viz., the Saṃhitā, and especially the *Brāhmaṇas* (see VEDA)—which contain the *dharma*, or religious law (see MĪMĀṂSĀ), it is also called *Uttara-mīmāṃsā*, or the investigation (*mīmāṃsā*) of the latter (*uttara*) part of the Vedas—viz., *Aranyakas* and *Upanishads* (q.v.), which treat of (the neuter) *Brahman*, or the Supreme Spirit [not to be confounded with (the masculine) *Brahman*, or the god of the mythological *Trīmūrti* (q.v.)]. Sometimes the name given to it is *Sāṃkhya-mīmāṃsā*, or the investigation of the soul (*sāṃkhya*). In its method, the Vedānta differs from the Nyāya (see NYĀYA and VAISĒSHIKA) by endeavoring to explain the universe as a successive development from one ultimate source or principle—whereas the Nyāya, in both its divisions, treats of the objects of human knowledge of which the universe is composed, under different topics, unconcerned about their mutual relation of effect and cause; and from the *Sāṅkhya* (see SĀṅKHYA and YOGA), it is distinct, inasmuch as that system is based on the assumption of a duality of principles whence the universe derives its origin.

The object-matter of the Vedānta is the proof that the universe emanates in a successive development from a Supreme Spirit or soul, which is called *Brahman*, or *paramātman*; that the human soul is therefore identical in origin with Brahman; that the worldly existence of the human soul is merely the result of its ignorance of this sameness between itself and the Supreme Spirit; and that its final liberation or freedom from transmigration (q.v.) is attained by a removal of this ignorance, that is, by a proper understanding of the truth of the Vedānta doctrine.

According to this doctrine, *Brahman* (neuter) is both the efficient and material cause of the world, creator and creation, doer and deed. It is one, self-existent, supreme, as truth, wisdom, intelligence, and happiness; devoid of the three qualities, in the sense in which created beings possess them; and at the consummation of all things, the whole universe is resolved or absorbed into it. From Brahman individual souls emanate, as innumerable sparks issue from a blazing fire. The soul, therefore, is neither born, nor does it die; it is of divine substance, and as such, infinite, immortal, intelligent, sentient, true. Its separate existence, as distinct from Brahman, is the cause of its ignorance; and this ignorance, which consists in regarding the world as a reality capable of subsisting without Brahman, has a double power—that of enveloping and projecting. By means of the former it makes the soul liable to mundane vicissitudes, as to the sensations of pleasure, pain, etc. The projective power of ignorance, when encompassing the soul in its fourth condition, or that of pure intellect (its other conditions are: waking, dreaming, and dreamless sleep) produces out of the darkness which then prevails the five subtle elements—viz., *ether*, which is the substratum of the quality sound; *air*, which arises from ether, the substratum of touch; from air, *fire* or *light*, the substratum of color; from light, *water*, the substratum of savor; and from water, *earth*, the substratum of smell. From these subtle elements are then produced 17 subtle bodies and the five gross elements. The former, also called *lingasārīra*, because they are bodies (*sārīra*) which impart to existing beings their individual character (*linga*), are the five organs of perception—viz., the organs of hearing, touch, sight, taste, and smell, which arise sev-

erally from the *pure* or inactive particles of each of the subtle elements; further, *two intellectual organs*, which are produced from the *mingled pure*, or inactive particles of the subtle elements—viz., *buddhi*, understanding, the function of which is to arrive at a certainty or conclusion, and *manas* (an organ of volition and imagination), the function of which consists in willing and doubting—thinking and referring the external objects to one's own self, being two functions common to both of them; lastly, *the five organs of action*—viz., the voice, the hands, the feet, the organ of excretion and that of generation, which are severally produced from the *foul* or *active* particles of each of the subtle elements; and *the five vital airs*, which are produced from the *mingled foul* or *active* particles of the subtle elements—viz., the air breathed forth, which has its place in the fore-part of the nose; the air breathed downward, which has its place in the lower intestines; the air which circulates through the whole body; the ascending air, which has its place in the throat, and the descending air in the middle of the body, which causes assimilation and digestion of food, produces semen, excrements, etc. (Later Vedāntists assume ten such vital airs—viz., besides the foregoing, the airs which severally cause retching, winking, hunger, yawning, and fattening.) The five *gross elements* are the five subtle elements, when, according to a theory derived from a scriptural text, they have become so divided and combined that each of them retains a preponderating portion of itself, and consequently of the quality of which it is the substratum—as ether of sound, etc.—and besides smaller portions of the other subtle elements, and the qualities of which they are the substrata. From these gross elements then arise the various (mythological) worlds, and this world, too, with bodies which are distinguished as viviparous, or those produced from a womb, as men, beasts, etc.; oviparous, or those produced from an egg, as birds, snakes, etc.; those generated by "sweat" or hot moisture, as lice, gnats, etc.; and those germinating, as creepers, trees, etc. The soul, when existing in the body, is encased in a succession of "sheaths." The first or interior "sheath" consists of *buddhi*, associated with the organs of perception; the second, of *manas*, associated with the organs of action; and the third, of the vital airs together with the organs of action. These three "sheaths" constitute the subtle body of the soul, which attends the soul in its transmigrations; and the collective totality of such subtle bodies is the supreme soul, as regarded in its relation to the world; when it is also called "the soul which is the thread," or passes like the thread through the universe, or *hiran'yagarbha*, or life. The fourth and exterior "sheath" of the soul is composed of the gross elements; and the collective aggregate of such gross bodies is the gross body of the deity. This whole development being the result of ignorance, the soul frees itself from its error by understanding that the different stages in which this development appears, do not represent real or absolute truth; and when its error has completely vanished it ceases to be re-born, and becomes reunited with Brahman, whence it emanated. But since the means of arriving at a final deliverance can only be the complete mastery of the truths of the Vedānta, other means, such as the performance of sacrifices or other religious acts enjoined by the Vedas (q.v.), or the practice of Yoga (q.v.), cannot lead to the same result. They may be meritorious, and are even recommended as such, but can effect only an apparent liberation. Of this there are two kinds: one liberation which is effected in lifetime, and enables a man to perform supernatural actions or wonders, as the evocation of the shades of progenitors, going anywhere at will, and similar feats; and another which takes place after death, and enables the soul, not divested of its subtle body, to reside in heaven; but after a time its effect ceases, and the soul has to renew its mundane existence. In order to fit the mind for meditating on these truths, various moral duties are enjoined, and various practices are recommended, especially by later Vedānta writers. Thus, the student of the Vedānta is told not to hurt a sentient being, to speak the truth, not to steal, to practice continence, and not to accept gifts; to remain pure and content, to do penance, and to study the Vedas; also to remain in certain postures, to practice various modes of suppressing his breath, and the like. These injunctions, however, are extraneous to the doctrine itself, and appear to be a compromise with the old orthodox faith, which requires the performance of religious acts, and a later stage of it, which favors such austere practices as are especially known by the name of Yoga (q.v.). The doctrine of *bhakti*, or faith, does not belong to the older Vedānta; it is, however, an interesting feature of the later periods of this philosophy; and the same observation applies to the doctrine of *Māyā*, or illusion, according to which the world has no reality whatever, but is merely the product of imagination; for the older Vedānta, as will have been seen, merely teaches that the world is not *the truth*, but does not deny its material reality.

The oldest work on this philosophy is attributed to Bādarāyaṇ'a, or Vyāsa (q.v.), and is written in the Sūtra (q.v.) style; it is called the *Brahma-Sūtra*; it consists of four *adhyāyas*, or lectures, each subdivided into four *pādas*, or chapters; each *pāda* containing a number of Sūtras. The number of the latter is 558, and that of the *adhikaraṇas* or topics treated in them, 191. The most important commentary on this work is the *S'ivabrahma-sūtra-bhāṣya*, by Sankarācārya (q.v.); and this commentary, again, has been commented on by a great variety of writers. The text of the Sūtras and this commentary have been edited at Calc., 1818; and the text with this commentary, and a gloss on the latter, by Govindānanda, in the *Bibliotheca Indica*, by Pandita Rāma Nārāyaṇ'a Vidyaratna, Calc., 1863. Of the great number of other commentaries on the

Brahma-Sûtras, mention may be made only of that by *Rāmānuja* (q.v., under VAISHN-
AVAS), and of a short but very lucid one, by *Anūpandrāyaṇ'as'īroman'ibhat't'a* (edited at
Calc., without date). Among elementary treatises on the Vedānta, the most popular is
the *Vedāntasāra*, by *Sudānanda*, which, with the commentary of *Rāmākriṣṇ'a Tīrtha*,
has been edited at Calc., 1829, and with this and another commentary by *Nṛsiṅhasur-
asratī*, at Calc., 1849. It has been edited and translated also by the late Dr. J. R. Bal-
lentyne (*A Lecture on the Vedānta, embracing the Text of the Vedānta Sāra*, Allahabad,
1850), who also translated the beginning of the Brahma-Sûtras.—A very useful compen-
dium of the *Adhikaran'as*, or topics, is the *Adhikaran'amālā*, by *Bhāratīrīrtha*, which,
with the commentary of *S'rī Anandachandra-Vedāntarāgīs'a*, has been edited, Calc., 1862,
and as an appendix to the Brahma-Sûtras, with extracts from this commentary, in the
Bibliotheca Indica, 1863.

VEDDER, ELIUT, b. N. Y., 1836; studied with Matteson; visited Europe; and, on
returning to this country, opened a studio in New York city. Since that time he has
resided in Italy, and is distinguished as a *genre* painter. Among his most celebrated
pictures are "The Lair of the Sea Serpent;" "The Arab Listening to the Sphinx;"
"The Monk upon the Gloomy Path," etc.

VEDETTES are mounted sentinels, placed about 100 yards in advance of the outposts
of an army, to keep a strict watch upon the enemy's movements, and to signal imme-
diately the approach of danger. They should be placed two together.

VEER, in sailing, is to pass from one board to the other by bringing the stern to
windward. It is therefore the same action as *gybing* (q.v.).

VEGA, GARCILASO DE LA. See GARCILASO.

VEGA-CARPIO, LOPE FELIX DE, a celebrated Spanish poet, was born at Madrid on the
25th November, 1562. From his very infancy, he is said to have given promise of ex-
traordinary talent. Like Pope, he "flipped in numbers." On the death of his father, the
family, originally a good one, fell into great difficulties, and was broken up. The
young Lope fell to the charge of his uncle, the inquisitor, Miguel del Carpio, who spared
no pains to give him a good education. He was sent to the imperial college at Madrid,
and seemed to be progressing quietly toward the holy state, to which, by his uncle, he
was destined, when an odd whim struck the lad, and, being then fourteen, he went off
on a roving expedition with a comrade. But he and his companion were speedily arrested
as thieves on their trying to effect the sale of a chain of gold (probably stolen from
Lope's uncle), and sent back to Madrid. The returning prodigal was but coolly received
by his reverend relative, who declined to further concern himself with a nephew of such
distinctly *lay* propensities. He in consequence became a soldier; and in 1577 served at
Terceira against the Portuguese. After this we find him taken in hand by Geronimo
Manrique, bishop of Avila, who sent him to finish his studies at the university at Alcala.
Here he was again ripening for holy orders, and was nearly in fact ripe, when again the
passion of the vagabond drove him out upon the world a pervert. For some time, at
this period of his life, Lope disappears from public view; and probably his adventures
were of the kind which a discreet biographer will always permit his hero to prosecute
as far as possible in private. It is understood that in his dramatic romance, *Dorothea*,
he afterward favored the world with a sketch of himself and of these his early experi-
ences; and if this is in detail to be taken as history, Lope, on his own shewing, must
have been no more a model of propriety than certain other great poets who might be
named. Toward 1585 we find him again at Madrid, attached to the person of a young
duke of Alva, for whom he composed the piece entitled *Arcadia*, a tedious pastoral,
with verses interspersed, which only in detached passages displays his brilliant ability.
About this time he married a lady of condition, by the name of Isabella de Urbino; but
his domestic felicity was speedily cut short by a misadventure. Having had some dif-
ference with a gentleman of court, he satirized him in a filthy *lullaby*; and on finding
that he took it amiss, gave him satisfaction by running him through the body. For this
he was thrown into prison, and afterward exiled to Valencia. He returned to Madrid
as soon as he could with safety, and soon after lost his wife, whom he is said to have
tenderly loved. Grief for her death, complicated with want of success in another of his
little love-affairs, drove him to join the famous *Armada*, then being fitted out for the
conquest of England. Through the perils of this disastrous expedition Lope came
with a whole skin, and in 1590 was again safe in Madrid. A brother to whom he was
much attached, and who sailed as an officer in the same vessel, had not the same luck,
but died during the voyage. It is a characteristic trait, that Lope—who, whatever else
he may be doing, must always be conceived as flooding out continuous torrents of verse
—composed, amid the distractions of tempest and battle, a long poem, the *Hermosura de
Aenghea*, which, as a continuation of the *Orlando Furioso* of Ariosto, has found favor
even with express admirers of that poet. Shortly after his return he became secretary to
the marquis of Malpice and subsequently to the count of Lemos, whose service he quitted
soon after his marriage, in 1597 to Donna Juana de Guardio, resolving thenceforward to
trust solely to literature for his livelihood. This he could well do with every confidence, as
already one of the most admired authors of the day, and by far the most popular dramatist.
The years immediately succeeding, he himself frequently afterward refers to as the hap-

piest period of his life; but it was not of very long duration. At the age of seven, his son Carlos died; and soon after, in giving birth to a daughter, his wife also died. The double blow was severe. A mistress, indeed, remained to console him, Donna Maria de Luxan, by whom he had a boy and girl, the latter of whom, Marcela, was the most beloved of all his children. But he had no doubt got a little tired of Donna Maria; and about this time he began to turn his thoughts seriously to religion. Having had as much vice as he cared for, he considered he had reached the point in his career at which piety might begin to be prosecuted with advantage. Accordingly, after an interval of devout preparation, he became, in 1609, a priest of the order of St. Francis. Of his zeal in his new functions, there is evidence in the fact, that in Jan. 1623, he took prominent part in the ceremony of burning a heretical brother of his order. As to his performance of priestly duty otherwise, strictly thus much is known, that, with his old unremitting assiduity, he continued to pour forth poems and dramas, not always of a clerical or decent kind. During his last years, he fell into a profound religious melancholy. Despite the decay of his strength, he was rigorous in keeping himself up to the severest mark of discipline; in particular, he scourged himself terribly. Finally, in the beginning of Aug. 1635, he gave himself a scourging so terrible, that the walls of the chamber were found bespattered with his blood; and some days after he died of it, at the ripe age of 73. If the poet in his later days thus exercised a little severity with himself, we may allow him to have been the best judge as to how far the peccadillos of his earlier ones might deserve it.

Lope was the idol of his contemporaries; and on the fruits of his labor, he lived in Madrid in what might be called splendor, when the really far greater Cervantes was starving in the same street. To such an extent was the popular admiration of him carried, that his very name became a synonym of excellence; and people spoke of a Lope jewel, a Lope poem, or the like, as one of unsurpassable perfection. For a long time nobody else than Lope de Valencia was willingly heard on the Spanish stage; and his fame abroad (especially, of course, in Italy and in France) was almost as remarkable. In one quality, at least, Lope must be held to have surpassed all other poets—his productiveness was something portentous, and without parallel. Setting aside his other multitudinous performances, the dramas on which his popularity mainly rested, and which have since perpetuated his fame, have been calculated to number not less than 1800. He himself, in one of his latest works, more modestly puts them at something over 1500, and assures us that to write a whole drama in a day was no unusual feat with him. Even if we suppose in this something of the fabulous, there remain in print between five and six hundred of these pieces, to testify to his enormous fecundity; and it is certain that many more of his plays were acted, which have not in this form survived. The quantity of his work considered, its quality is not much less surprising. His fertility of invention is marvelous; the ease and grace of his versification are unsurpassed in the language in which he writes; and his pieces, even when slight in substance, are instinct with life and dramatic movement. In deep and serious qualities he is deficient, on which ground he is now ranked below his immediate successor, and some time contemporary, Calderon. With this single exception, he remains, however, the chief ornament of the Spanish stage, and a not inconsiderable figure in the dramatic literature of the world. An intelligent and full survey of his works, so far as the infinity of them permits it to be full, will be found in Ticknor's *History of Spanish Literature*, to which readers are referred.

VEGETABLE, in a scientific sense, is a term synonymous with plant. Organic nature is divided into the *animal kingdom* (q.v.) and the *vegetable kingdom*. See **PLANT**. The word vegetable is derived from the Latin *vegetus*, lively, or healthy. *Vegetation* is the term employed to denote the growth of plants.

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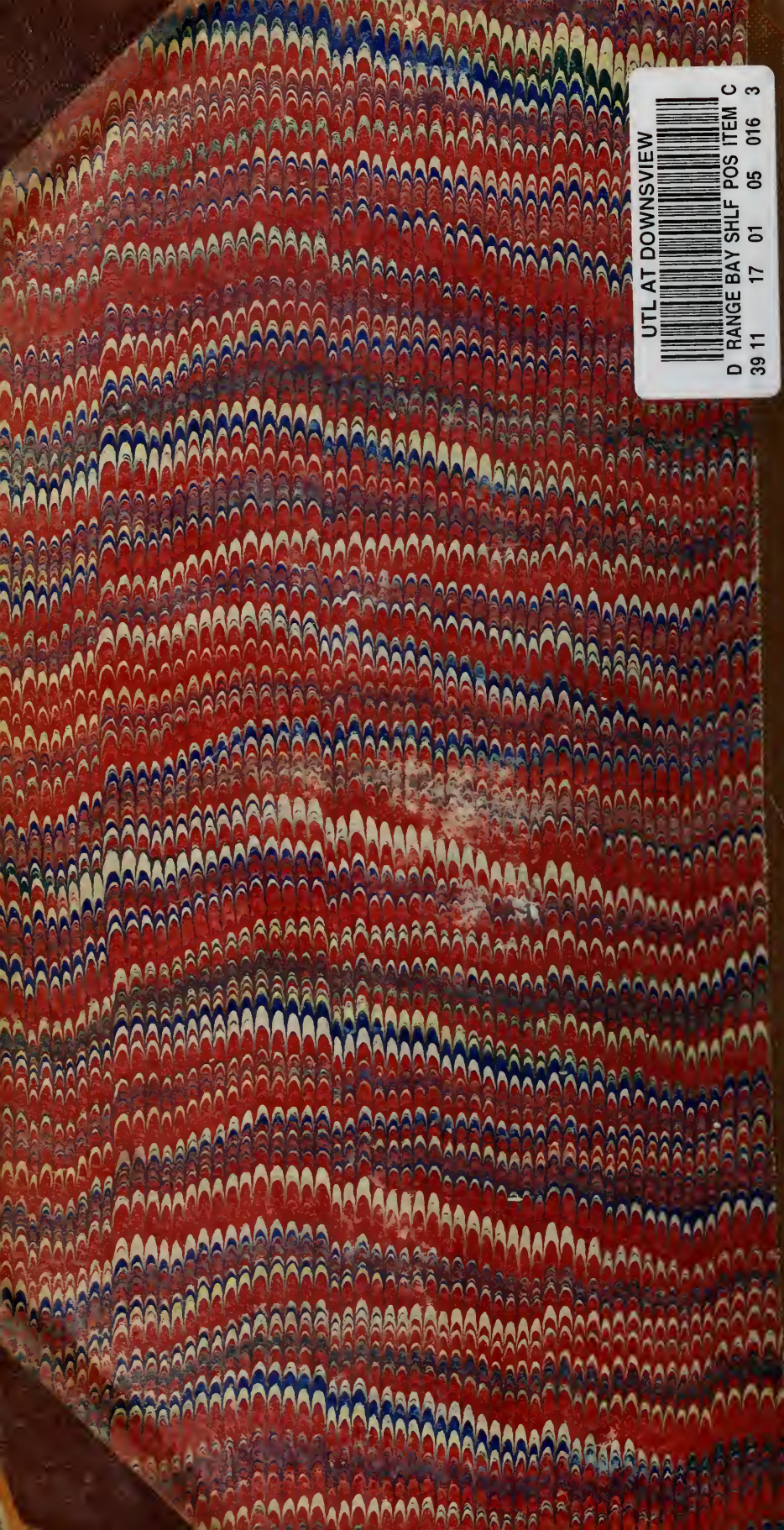
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